ADB

Food for All

Investing in Food Security in Asia and the Pacific—Issues, Innovations, and Practices

Asian Development Bank

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"Food security exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life."

– The World Food Summit of 1996

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Foreword

The global food and energy price surges in 2007–2008 and again in early 2011 underscore two major challenges to achieving food security in Asia and the Pacific: frequent food price volatility and the vulnerability of the region's food systems. Volatile food markets induce inflation, stymie the region's growth, and increase the number of the poor. Vulnerable food systems, if left unchecked, will reduce the availability, access, and utilization of safe and nutritious food.

Both challenges are major concerns in the region. Home to the largest number of the world's poor, Asia is among the most vulnerable to the impacts of economic shocks as well as climate change. Sustainable food security is a critical issue for countries in the region. As both the world's key supplier and largest consumer of food, what Asia does for its food security will have significant effects on ensuring sustainable global food security.

Issues and strategies dealing with food security challenges have been discussed on a global scale, but there has been no regional dialogue that has focused on Asia and the Pacific, where food security is imperative, as it affects sustainable and inclusive growth scenarios crucially.

It is against this backdrop that the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), and the Asian Development Bank (ADB) co-organized a regional investment forum for food security at the ADB headquarters in Manila on 7–9 July 2010.

Bannering the theme "Food for All," the Investment Forum on Food Security in Asia and the Pacific was attended by more than 400 participants from 30 countries and focused on the following objectives:

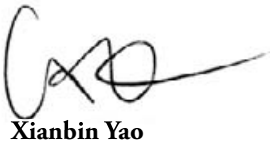
- Scale up and replicate food security investments in Asia and the Pacific.
- Promote and support country-driven food security strategies.
- Promote greater collaboration and partnership among governments, the private sector, international development agencies, civil society organizations, and others.
- Share innovations and good practices for rapid replication and expansion.

This book distills the wealth of information and depth of discussions derived from the proceedings of the landmark forum. With this book, ADB seeks to provide a better understanding of food security and the opportunities for realizing it through multisector and partnership approaches. We hope it will facilitate the sharing of knowledge, innovations, good practices, and lessons on investing in this field.

We thank FAO and IFAD for painstakingly working with our team from the Agriculture and Rural Development and Food Security Unit in preparing and organizing the forum. Our heartfelt thanks also go to the United States Agency for International Development and The Asia Foundation for sponsoring several of the participants and meeting some of the forum expenses as well as assisting in some plenary sessions.

We are grateful to our other development partners, civil society organizations, and all the presenters, moderators, panelists, and other participants who contributed to making the forum a success and who have now made this book possible, including the writers and editors of this book project.

Together with our FAO and IFAD partners, we hope that this book can serve as a platform for greater advocacy and action in support of the call of the times: Food for All.



Xianbin Yao
Director General
Regional and Sustainable Development Department
Asian Development Bank

Introduction

"Food security is a huge challenge. No single entity can address the issue. You have to connect all the dots. To me, that is the key, because knowledge dissemination, application on the ground, and faster delivery—all these will require all stakeholders to come together."

A participant in the first Asia- and Pacific-wide Investment Forum on Food Security summed it up well. This book seeks to connect the dots that make up the issue of food security by providing a compilation of knowledge, good practices, innovations, and lessons. All drawn from the forum, it weaves these together to enlarge understanding of the issues involved and to share the rich output of the forum with a broader audience.

The book presents the highlights of the proceedings of the three-day Investment Forum (Appendix). Each chapter closely corresponds to a session of the forum where presentations and interactive discussions took place. Some presentations have been shortened or condensed due to space considerations.

Introductions to several chapters acknowledge specific entities (e.g., FAO, IFAD, The Asia Foundation, USAID, ADB units) that were pivotal in organizing and providing support for particular sessions that parallel the content of these chapters.

As with the forum sessions, the chapters flow from one into the other. Taking off from the objectives of the forum, multisector response and innovative partnerships are key themes addressed in the opening chapters to overcome food security challenges in the region.

Another key theme links individual country plans under the common goal of making food security the underlying element of inclusive and sustainable growth. The forum focused initially on four countries and one subregion that are representative of the different areas of Asia and the Pacific and have existing policy, institutional, and strategic frameworks that readily support upscaling of food security investments in partnership with international organizations (ADB, FAO, IFAD, etc.), the private sector, and others. These are Bangladesh, the People's Republic of China, India, Lao People's Democratic Republic, and the Pacific subregion, which are featured in Chapter 3.

Fostering food security through regional cooperation is a clear thread that runs through the book. This is particularly highlighted in the discussion of noted development economist C. Peter Timmer about the role of rice in Asian economies and the collective actions that can be explored to stabilize rice prices as a "public good."

The range of food security issues is varied and complex and respected scientists, technical experts, and hands-on managers guide us through the maze with presentations that not only inform but inspire. The articles spotlight innovations and good practices—success stories for replication—as well as the necessary areas for reform and action.

In five succeeding chapters that mirror forum sessions, the book delves into the following thematic areas:

- **enhancing productivity investment**, which spans food security research, information and communication technology, agriculture advisory services, irrigation and land use, high-yielding technologies, veterinary services, aquaculture management practices, and post-harvest management;
- **upscaling innovations and good practices in natural resource management**, such as forest and coastal resource management, land/soil management, land use planning, and water resource management;
- **increasing investments for resilience**, which include risk management, early warning systems, financing for climate proofing and climate change adaptation, weather index insurance, food fortification, and nutrition;
- **innovative financing for food security** through credit, farmer access to finance, contract farming, and commodity exchange; and
- **enhancing connectivity investments for food security** through rural infrastructure, market facilitation and value chain development, fostering rural small- and medium-sized enterprises and producer organizations, improving food safety and quality standards, and market information dissemination.

The participation of civil society organizations from across Asia and the Pacific enriched the forum's output to reflect the actual needs and interests of the grassroots sectors. In a manifesto, they expressed hope and openness to the possibility of real changes that could happen in the countryside as a result of a more engaged partnership with development agencies on rural investments.

The forum culminated with the signing of the Asia and the Pacific Regional Food Security Partnership Framework by the three major organizers—ADB, FAO, and IFAD. This partnership document is published here in full.

The publication of this book was a collective effort under the supervision of ADB lead agriculture specialist Lourdes Adriano, with the invaluable editorial assistance of Fides Lim, Ma. Lourdes Ronquillo, Amelia Esteban, Stephen Banta, and Jill Gale de Villa, and the logistics support of Rhea Juliano and Bernadette Agustin.

Abbreviations

ADB	Asian Development Bank
AI	avian influenza
APEC	Asia–Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
ASEM	Asia–Europe Meeting
AusAID	Australian Agency for International Development
AWD	alternate wetting and drying
B	Thai baht
BRIC	Brazil, the Russian Federation, India, and China
CA	conservation agriculture
CABI	Centre for Agricultural Bioscience International
CBD	Convention on Biological Diversity
CBO	community-based organization
CGIAR	Consultative Group on International Agricultural Research
cm	centimeter
CIP	Country Investment Plan of Bangladesh
CRS	Catholic Relief Services
CSO	civil service organization
DA	Department of Agriculture
DFID	Department for International Development of the United Kingdom
ECTAD	Emergency Centre for Transboundary Animal Diseases
Ed.	Editor
EID	emerging infectious diseases
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAO–RAP	Food and Agriculture Organization Regional Office for Asia and the Pacific
FFS	Farmer Field School
FMD	foot-and-mouth disease
FSSLP	Food Security and Sustainable Livelihood Programme
FUG	forest user groups
GAIN	Global Alliance for Improved Nutrition
GAP	Good Agricultural Practices
GDP	gross domestic product
GDPRD	Global Donor Platform for Rural Development
GEM	Growth with Equity in Mindanao
GHG	greenhouse gas
GRiSP	Global Rice Science Partnership

GMS	Greater Mekong Subregion
Gt	gigaton
ha	hectare
HPAI	highly pathogenic avian influenza
ICM	integrated coastal management
ICT	information and communication technology
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
IFPRI–NDO	International Food Policy Research Institute–New Delhi Office
ILO	International Labour Organization
IRRI	International Rice Research Institute
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
kg	kilogram
PDR	People's Democratic Republic
M&E	monitoring and evaluation
MDG	Millennium Development Goals
MFF	Mangroves for the Future
mt	metric tons
NFP	National Food Policy
NGO	nongovernment organization
NTFP	nontimber forest products
OIE	World Organisation on Animal Health (formerly Office International des Epizooties)
PDSR	participatory disease surveillance and response
PES	Payment for Ecosystem Services
PIC	Pacific Island Countries
PIF	Pacific Islands Forum
PPP	purchasing power parity
PRC	People's Republic of China
R&D	research and development
REDD	Reducing Emissions from Deforestation and Forest Degradation
RPFS	Regional Programmes for Food Security
RSDD	Regional and Sustainable Development Department (ADB)
RSOD	RSDD Office of the Director General (ADB)
SAARC	South Asian Association for Regional Cooperation

SME	small and medium enterprises
SMS	short message service
TAD	transboundary animal disease
UK	United Kingdom
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNEP–WCMC	United Nations Environment Programme–World Conservation Monitoring Centre
UNEP ROAP	United Nations Environment Programme Regional Office for Asia and the Pacific
UN–REDD	United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization
WTO	World Trade Organization
WVI	World Vision International
WWF	World Wildlife Fund / World Wide Fund for Nature

Chapter 1

A multisector response to food security

Food for all has long been a struggle for a region that is home to two-thirds of the world's poorest and hungriest. The three main conveners of the first Investment Forum on Food Security in Asia and the Pacific set out the building blocks to squarely address this challenge at the opening ceremonies on 7 July 2010. Their common framework was the need to boost investments in the agriculture and food sector to make this more productive, resilient, and responsive to the needs of people.

Message of Haruhiko Kuroda

President
Asian Development Bank

With a projected gross domestic product growth rate of 7.5% for 2010, the Asia and Pacific region is rebounding strongly from the recent global economic, financial, food price, and fuel price crises. The region's strong macroeconomic fundamentals, coupled with the emergency fiscal and monetary stimulus packages enacted by governments over the past 2 years, appear to be having their intended effect.

In early 2010, a report by the Asian Development Bank (ADB) and the United Nations noted the region's remarkable progress in achieving several of the Millennium Development Goals (MDGs), especially in areas such as poverty reduction, access to education, and reducing by half the number of people without access to safe drinking water.

But the report also found that the region's overall MDG performance continues to lag in the crucial areas of hunger and food security.

Today, more than a quarter of the region's children age 5 and younger are moderately to severely underweight, and more than a third are moderately or severely stunted. Moreover, 18% of infants have low birth weight.

The region's vulnerability to hunger and food insecurity was made particularly apparent during the food crisis of 2007 and 2008. According to Food and Agriculture Organization data, soaring food prices caused more than 100 million people to join the ranks of the global hungry last year alone. The effects of this trend have been felt most acutely here in our region, where two-thirds of the world's one billion hungry people now reside.

Contrary to what many people may think, the recent food crisis was not the result of grain shortages. Instead, it was caused by a complex range of factors that include protectionist food policies and longstanding neglect on the part of governments to provide incentives for the private sector to invest in agriculture.

These key areas of policy and investment are the very building blocks on which we must now focus to ensure that this region's agriculture sector can become more productive, resilient, and attuned to the consumer market in the future.

So what needs to be done to put these building blocks in place?

First and foremost, we need to develop an enabling policy and institutional environment for the private sector to support the development of the food supply chain.

We need to boost investment in the agriculture and food sector, particularly in the areas of rural infrastructure. The physical connections between food producers and consumers who rely on them must be improved.

We must introduce productivity-enhancing measures—such as irrigation and water resources management—and invest more in research and development.

Most importantly, we need to act collectively, and that is what brings us here today.

For our part, ADB views food security as one of *the* underlying components for sustainable and inclusive economic growth. Earlier this year, ADB approved an Operational Plan for Food Security in Asia and the Pacific. It calls for a multisector approach to improve the productivity, connectivity, and resilience of food supply chains; enhanced partnerships; and increased but focused support for agricultural research.

ADB has committed $2 billion a year toward this plan, which harnesses our comparative strength in the infrastructure, environment, regional cooperation, finance, and education sectors.

We hope that this sum will complement and help galvanize the work of our development partners, the public and private sectors, and civil society organizations that are committed to making hunger a problem of the past.

The presence of so many of you here today shows that there exists a collective determination to tackle food security challenges.

Achieving food security at the regional, national, and household levels has long been a struggle for the region, even during the best of economic times. Building on the hard lessons we learned during the 2008 food price crisis, a sustainable and balanced economic rebound in Asia presents us with a golden opportunity for harnessing our collective resources to achieve food security.

It is high time to move out of our comfort zones and forge new partnerships, collaborative arrangements, and networks with the single objective of achieving Food for All. We hope that at the end of the forum we will have committed to concrete steps for building food security alliances at the country and regional levels.

Message of Jacques Diouf

Director-General
Food and Agriculture Organization of the United Nations

During the past 3 years, hunger has dramatically increased in the world on account of soaring food prices and the global financial and economic crisis. In 2009, there were 1 billion hungry people in the world, an increase of about 100 million over the previous year. In the Asia and Pacific region alone, the number of undernourished people increased by over 60 million in 2009 to 642 million.

The sheer magnitude of food insecurity is the result of the low priority that has been given to agriculture in economic development policies, as shown, for example, by the drop in the share of agriculture in official development assistance, from 19% in 1980 to about 5% today.

The Food and Agriculture Organization of the United Nations (FAO) estimates that food production must rise by 70% in the world by 2050.

In the Asia and Pacific region, agriculture accounts for 11% of the gross domestic product of its developing countries and over 50% of total employment. In view of the critical dependence of this region's people on agriculture for their food security, it is encouraging to note that the long-standing neglect of agriculture is finally being reversed.

Through the Food Security Initiative, the Group of Eight (G8) committed in 2009 in L'Aquila, Italy to mobilize $20 billion over 3 years for food security and agriculture. In Toronto, in June 2010, the G8 kept the same commitment. This is a step in the right direction, provided that it is implemented effectively and rapidly.

To assist the efforts of member countries to achieve the World Food Summit and Millennium Development Goal targets on hunger reduction, FAO has assisted several countries and regional economic organizations in the Asia and Pacific region in the design of their national and regional programs for food security. FAO also launched, in December 2007, the Initiative on Soaring Food Prices to facilitate access by small farmers to indispensable inputs. In Asia and the Pacific, agricultural inputs worth $8 million have been provided to over 140,000 small farm households in 24 countries. In addition, through the European Union Food Facility program, FAO has made available $100 million to the Asia and Pacific region to benefit a quarter of a million households.

The Investment Forum on Food Security in Asia and the Pacific, sponsored by the Asian Development Bank, FAO, and the International Fund for Agricultural Development, has a vital role to play. I am particularly pleased that it has been agreed to open the forum to nongovernment and intergovernmental organizations, representatives of civil society, the private sector, research institutions, other international financial institutions, and other United Nations agencies.

Message of Kanayo Nwanze

President
International Fund for Agricultural Development

IFAD
Enabling poor rural people to overcome poverty

The food price crisis of 2007 and 2008 is still fresh in our memories. It caused widespread food shortages and food and nutrition insecurity, particularly among poor children, women, and men.

As home to the largest number of poor and undernourished people in the world, the Asia and Pacific region was at the epicenter of the crisis and was hit extremely hard.

Although food prices have eased since then, they are still higher than pre-2007 levels. More importantly, recent studies indicate that food prices will remain high and volatile in the future.

Although challenges related to food security have been discussed at several global forums, the focus has generally been on making political commitments to address food security issues. What is different about this forum is that it provides a unique opportunity to focus on increased investments to strengthen food security in Asia and the Pacific.

Long-term growth in agricultural productivity is imperative for food security. Productivity growth expands supplies, reduces prices, and raises the incomes of smallholder farmers.

At the same time, productivity growth ensures affordable and adequate food for poor women and men and disadvantaged groups.

We know that there is significant potential to raise agricultural productivity and food production in the region. This can be done by improving crop management, expanding the use of modern varieties, strengthening rural infrastructure, and improving postharvest technologies. Adequate funding for research and development must also be provided.

Support must be extended to enable smallholders to expand their production and gain greater access to markets. We must promote agricultural research that focuses on their needs, because many of them farm in agroecologically fragile regions. We must boost their access to agricultural services, including extension and financial services. We must secure their access to natural resources such as land and water. And we must enable them to diversify their sources of income.

We must also help them to strengthen their livelihoods in the face of greater climatic uncertainty. And we must build their awareness of the benefits to be gained from new approaches to managing weather and other risks.

Although the challenges are many, the region also stands to gain from a range of promising opportunities. Dynamic private sector investments are leading

the development of new agrifood industries and market openings that provide important linkages between small producers and markets.

There is also a high level of political commitment among national governments to making long-term investments in agriculture. In many countries of the region, public investment in agriculture has increased in recent years, and bilateral and regional trade has expanded.

This forum is an important venue for sharing innovations and good practices on new approaches to sustainable and inclusive food security. It will provide a unique opportunity for governments, private sector actors, civil society representatives, and development partners to work together and discuss concrete investment plans for several countries of the region.

I hope that specific action plans for investment in enhancing food security through higher production and productivity will be the result.

The International Fund for Agricultural Development (IFAD) is happy to have the opportunity to collaborate with the Asian Development Bank and the Food and Agriculture Organization of the United Nations in co-organizing this important regional event. We are also developing a regional partnership framework among the three organizations to support countries through coordinated food security engagements that take into account their specific priorities and constraints. I hope that other development partners will also join this initiative.

Chapter 2

Food for all through innovative partnerships

James Bolger weaves in the themes of partnerships and challenges in his keynote address at the Investment Forum on Food Security in Asia and the Pacific on 7 July 2010. He notes that we will be able to feed the world only when we face head-on the bigger issues that should be kept at the forefront of any debate on alleviating hunger. He urges, "It is now a time for new thinking, as yesterday's thinking will not solve tomorrow's problems."

A call for a new paradigm

Rt. Hon. James B. Bolger ONZ
Chairperson, International Advisory Board
of the World Agricultural Forum
Prime Minister of New Zealand, 1990–1997

Making minor adjustments will not feed tomorrow's world; to have food for all will require radical rethinking on how the world moves forward.

Good morning and greetings to all.

E nga rangatira, nga kaumatua, nga kuia, nga waka me tehau kainga, tena koutou, tena koutou katoa.

To the many chiefs, elders, women, the *waka*, and the home people, my greetings. The literal meaning of the Maori word for leader, *rangatira*, is "to weave people together." That, I am sure, is the ambition of this gathering.

I want to thank the organizers for their invitation to join you today. I was invited as the Chairman of the International Advisory Board of the World Agricultural Forum (WAF). Based in St. Louis, USA, WAF, as a nonpartisan organization, seeks to engage with all who play a part in the global food chain, from landless peasant farmers to global corporations.

Through hosting conferences large and small, we seek to stimulate debate on all aspects of food production, including the wise use of land and water, the role of science, distribution networks, government policies, and specifically trade policies that impact on the production and distribution of food. WAF's most recent conference was held a few weeks ago in Brasilia and focused on the role that South America can and must play if we are able to feed a world of 9 billion people in 2050.

As for me, in addition to everything else, I have been a farmer all my life, someone who actually produces food and has lived through the vagaries of Mother Nature, changing economic paradigms, open and closed markets, and trade distortions to protect the favored, to mention but a few of the issues with which farmers and those who provide the necessary infrastructure to support them must work.

To state the obvious, to meet the food needs of people everywhere, we must include in the partnership and planning not only those who spend their lives in treasury departments, academia, or policy groups, but also those whose hands are

battered by hard work and whose faces are weathered by a life in the outdoors, actually producing food.

I take this early opportunity to acknowledge the outstanding leaders who will be making presentations; I know that they will not only stimulate debate but energize the passion required to develop a better framework to meet the needs of people everywhere.

Time for new thinking

The theme of my remarks this morning is that it is now a time for new thinking, as yesterday's thinking will not solve tomorrow's problems.

In September 2000, almost 10 years ago, the United Nations (UN) Millennium Conference in New York attracted the largest group of world leaders in history. They gathered at a time of optimism: the Cold War was over, the world economy appeared strong, and the terrorist attacks of 9/11 were still a year away. And so, motivated by good intentions, they signed on to the goal of halving world poverty by 2015, now only a short 5 years away.

The good news is that, with the work of many, including those organizations represented here, millions have been lifted out of poverty, and we should celebrate that success. Unfortunately, with population growth, the bad news is, as the Executive Director of the UN World Food Programme said a little while back, "hunger is on the march." Two hundred million more have joined the ranks of the hungry in the last few years.

And now, unlike in 2000, there is limited confidence in the construct of the world economy. The financial crash of 2007–2008 exposed its fragility, and this has shattered confidence in the prevailing economic model.

Commentators are divided on whether there should be more stimulus or greater fiscal austerity. The debate reminds me of a saying of that unique American, Woody Allen: "More than at any other time in history, mankind faces a crossroad. One path leads to utter despair, the other to total extinction. Let us pray we have the wisdom to choose correctly."

I pray that we have the wisdom to choose a different path altogether.

In that context, while the world is open in its admiration of the success of many economies in the dynamic Asia and Pacific region, we cannot move forward in isolation, as the problems we face are global, and there is still much to be done in our region.

We all know that the great challenge of our time is how we will meet the needs of the projected 9 billion people in 2050 when we are not meeting the basic needs of only 6.5 billion today.

There are no easy answers on how the world will meet this challenge, for, if there were, a billion plus people would not be hungry today.

The late Archbishop of Olinda and Recife in Brazil, Dom Helder Camara, who was an activist for the poor, once observed that "when I give food to the poor,

they call me a saint, but when I ask why the poor have no food, they call me a Communist." While I absolutely agree that it is essential to provide food to the hungry, we will feed the world only if we answer the bigger question, "Why do the poor have no food?" We must insist that policy makers keep that question in the forefront of any debate on alleviating hunger.

My suggested topic is "Food for All Through Innovative Partnerships." Partnerships imply working together, contrary to the approach favored by most economic theorists in recent times, which has emphasized individuals and firms acting in their own self-interest rather than in the interest of the broader community.

"Food for All" is so easy to say, but is the world really working through economic and trade policy to achieve that goal, or is it just something that people in authority feel they should say and then move on? But move on to what? In reality, there is nowhere to hide; the old concept of absolute national sovereignty no longer exists, as each new international agreement redefines sovereignty and creates a new interdependence, which became very evident in the global meltdown and now in the uncertain recovery.

From my perspective, to succeed, the world must construct a new paradigm that discards the concept of a globalization driven by a few big players and instead moves to recognize the needs of an integrated world community. Within the paradigm, the most important partnership is that between public policy and the needs of the people.

To put it into context, let me take you back for a moment to the political debate following the 2007–2008 crash and the introduction of massive stimulus packages everywhere to prevent the total destruction of the current economic model. The message went out in country after country that they must *spend*—remarkable advice, given that both citizens and governments were in general overburdened by debt; but the economic masters could think of no other approach, so the message was "spend, spend." There must be a better way.

Let me suggest a different approach, a bold new partnership that focuses on bringing the 3 billion citizens worldwide who currently live on less than $2.50 a day into the world economy and so would create a huge new market for goods and services.

Such an approach would achieve two major objectives—lift hundreds of millions out of poverty, and create a new engine for sustainable growth in the world economy—sustainable in that over time it would move consumption from those who are already consuming too much of Mother Earth's resources to those who need to consume more to achieve dignity in life.

Essential partnership with water and land

The next essential partnership if we are to achieve food for all is that among water, land, science, finance, and people. I will say a little about all five.

All of us know that water supplies are finite —97% is in oceans and salty, and 2.5% is locked up in a frozen state; so all living creatures other than those in the ocean have to survive on about 0.75% of the world's water.

Statistics like that concentrate the mind and underpin why the world will either cooperate on the shared use of water or go to war over it. That blunt statement is an absolute.

An example is the great Nile River, the longest in the world. Currently, under agreements reached in the colonial era, Egypt, which relies on the Nile for 90% of its water, is the greatest beneficiary, but other countries in the Nile Basin are seeking to renegotiate the old agreements—not, I understand, to reduce Egypt's essential water but to use the Nile's gift of water in a more beneficial way for others by agreeing to, for example, "run of the river" hydro schemes to generate power for Uganda, which has one of the fastest growing populations in the world.

I do not intend to develop the issue of the Nile further, but it is an example, and there are many others, of how fresh water for multiple uses is under extreme pressure in many regions of the world.

To make progress, we must change the thinking of history that water is free. Fresh water is the most valuable resource on the planet, and as such, is of immense value. What is considered free will inevitably be used in a wasteful manner, which is what is happening now.

An example is the use of vast areas of fertile land and water to grow maize for biofuel to power motor vehicles rather than feed people. This is not an accident but rather the result of deliberate government policy, and is extremely wasteful.

As part of the new partnership to produce food for all, every country and community must, as an urgent priority, develop strategies to achieve the most beneficial use of water, including proactively deciding when, for whatever reason, water should be allocated without cost to individuals and groups. With the UN forecasting that over 60% of the world's population will soon be living in water-challenged regions, proceeding with this partnership is a must-do requirement.

Likewise, the world must also develop new thinking regarding the use of land and, if necessary, impose the regulations needed to prevent one generation from destroying the essential means of life through either need or greed.

Every year, the misuse of land means that large areas are forever lost to food production due to, for example, the ravages of desertification, saline poisoning, or erosion, and the ever-growing demands of urban growth.

Leaders must not shirk from, if necessary, imposing more stringent requirements on the use of land and water, for, after all, they sustain all life. Recall there is agreement that countries should abide by international conventions like the Nuclear Non-Proliferation Treaty to prevent the spread of nuclear weapons, and should adhere to the 1972 Biological Weapons Convention. Those treaties are to protect life, and protecting land and water is likewise to sustain life.

To provide food for all is a massive task, and the hardest part is to gain acceptance that widespread change is necessary to achieve our goal. Current

policies cannot feed today's world, and making minor adjustments will not feed tomorrow's world.

That said, within the current world construct, many initiatives like microfinance can and will feed millions. Providing better cultivars and new seeds and making better use of currently available water will all play a major role in reducing poverty and therefore must be aggressively implemented wherever possible. But in my view, to have food for all will require a radical rethink on how the world moves forward. My argument is that the world must set the economic sails differently if we are to achieve sustainable solutions.

Wise use of science and technology

I have spoken of the need for the responsible and wise use of land and water. We must husband and care for what we have, because we can acquire no more.

Science is different. The Stone Age did not end because of a lack of stones; it ended when the known science devised a new way to achieve society's goals. With science, we are constantly acquiring more knowledge, greater understanding, and new possibilities.

For example, when in 1995 scientists began to read the full gene code sequences of bacteria, insects, plants, animals, and humans, it opened the door to a range of new possibilities. That door cannot be closed, and it is now up to society—I use that term deliberately, because no one would suggest that such powerful new possibilities should be left entirely to an unsupervised marketplace—to collaboratively determine how the wonders of new science should be used.

A few years back, research demonstrated how potatoes and bananas can be used to vaccinate against diseases like cholera, hepatitis, and diarrhea. Work is in progress to custom-design medicines to meet the specific needs of individuals as determined by their gene code. This is progress.

Most have forgotten the huge debate when the world heard about the first child ever conceived outside a mother's womb, Louise Joy Brown, who was born on 25 July 1978. Now the procedure is relatively commonplace.

The world changed again almost 20 years later when the lamb Dolly was born on 23 February 1997, cloned from an adult cell. Everyone realized the implications were challenging, and many raised moral and ethical issues.

My purpose in raising these issues is not, on this platform, to debate the moral and ethical issues but to remind us of the different possibilities that are going to be part of tomorrow's food chain.

In 1804, when the world's population first reached 1 billion, science played but a modest role in producing the required food. Recall that, because science had no answers, millions died when a common blight destroyed the Irish potato crop in the 1840s. By 1927, when the world population had reached 2 billion, science was beginning to play a much bigger role.

In the early 1960s, when the population was around 3 billion and the world faced the possibility of widespread starvation, governments, agencies, and science came together in a remarkable endeavor to focus on developing solutions that became known as the "Green Revolution." And in 40 years, by 2000, the world was feeding an additional 3 billion people.

Yes, millions were still hungry, but 3 billion more people were being fed, a remarkable achievement. Now the world has to do it again, and again it will be achieved by the wise use of science.

I am clear in my view that the world will need to utilize all the responsible science available to produce the food required and that includes genetic modification. This will be necessary to enable, for example, the development of plants that will grow on those salt-damaged and dry lands I spoke of earlier.

I will not speculate how the world will use some of the developments I spoke of earlier, but it requires little imagination to see developments that could revolutionize not only the production but also the nutritional and medicinal value of tomorrow's food. Another important development will be to produce food in a way that has minimal environmental impact and possibly has environmental benefits.

The big challenge will be to devise a realistic process to ensure that commercially developed higher producing, pest-resistant, and environmentally friendly plants are actually made available to farmers, especially those in poor countries. To achieve that will again require a new approach such as a partnership among plant breeders, who need markets; growers, who need a new generation of seeds; and governments that consider it necessary to produce more food for their people. Sensible cooperation will ensure that all parties benefit. In this space, progress will come from political realism, not political absolutes.

Someone once said that "technology is not kind; it does not wait; it does not say please—it slams into existing systems and often destroys them while creating a new system."

You do not have to buy into the whole argument to acknowledge that science and technology will continue to reshape food production.

Different economic models of history

Cooperatives have long played a vital role in assisting economically weak links in the production and marketing chain. On 3 July 2010, the UN International Day of Cooperatives celebrated the theme, "cooperative enterprises empower women." I applaud such encouragement, as all know that the role of women has long been important in agriculture, and, in much of the developing world, the input of women is essential for success.

It is not only the economically weak who can benefit from cooperatives, as the success of New Zealand's giant dairy cooperative Fonterra demonstrates. Fonterra

is owned by 12,000 individual dairy farmers and is an example of bringing finance, land, water, science, and people together to create the world's largest exporter of dairy products, based on New Zealand's unsubsidized dairy industry.

Many economists in New Zealand and elsewhere disagree with the cooperative model. Working together seems to upset some of them, and they argue on a regular basis for the company to be floated on the stock exchange. But the farmers have resisted, as they have inherited from their forebears the story of dairy cooperatives being established during the Great Depression of the 1930s to rescue that generation from poverty.

That said, all partnerships at the production end will fail to achieve our collective goal of food for all unless we also embrace a different approach for the world economy. The world needs to accept that no single model fits all. Academic economists have long sought a model that fits all, yet reality says that countries and societies with different histories and cultures at different stages of development require different approaches. To take the lessons of history forward requires candor and the honesty to admit mistakes, and then the courage at the leadership level to implement or apply what has been learned.

A case in point is the current attachment to what is described as the "neoliberal" or "neoclassical" economic model. Such attachment is misplaced, as demonstrated by the recent meltdown of the world economy. To some that sounds dramatic, but to me it is but simple logic to note that if the present world economic and trade model, after decades of effort, has thus far failed to feed the world, on what possible grounds can we expect it to do so in the future?

One reason I accepted your invitation was to encourage you as leaders in influential positions, committed to usher in a better tomorrow, to open your minds to think the unthinkable, for without that we will not succeed. You will not be alone.

Former long-time Chairman of the United States (US) Federal Reserve, Alan Greenspan, in written testimony to Congress in October 2008, said that the "derivatives implosion" had left him in a state of "shocked disbelief." He was asked whether his lifelong ideology had been shaken, and Greenspan replied with characteristic circumlocution, "I think I have found a flaw in the model that I perceived as the critically functioning structure that defines how the world works." What he meant was "yes."

None of us like admitting mistakes, but to make progress, we must let go of some cherished models that may sound great in the cut-and-thrust of economic debate but have failed in the harsh realities of the real world. The economic theory underpinning international Communism is a case in point. It failed and was pushed aside, or if you prefer dumped, when the Berlin wall was pushed over.

My approach is that our priorities must change, as it is clear that yesterday's thinking will not solve tomorrow's problems. As Albert Einstein succinctly put it, "We cannot solve our problems with the same thinking we used when we created them."

Let me reflect on that self-evident truth by noting that through the centuries various political/economic models had been used with varying degrees of success. At the dawn of the 20th century, when the world population had yet to reach 2 billion, there was an undercurrent of debate on how the world's political and economic structures should be organized. At that time, many of the countries of the Asia and Pacific region and elsewhere were still colonies of the developed nations of Europe; the US had yet to be fully acknowledged as a world power; the transforming potential of the internal combustion engine was still being debated; and the internet had yet to be thought of. However, the worst excesses of the Industrial Revolution were being resolved, and there was a great belief that people everywhere could look forward with a degree of optimism because of the scientific and industrial developments of the new age.

The collapse of the free market system in 1929 ushered in the Great Depression, which caused great distress to millions worldwide and massive destruction of wealth; it traumatized a generation, and in 1933, Franklin Roosevelt was elected President of the US.

President Roosevelt and other leaders of similar political mind were prepared to have the government intervene in the market to establish programs to meet the desperate needs of people. Belief that the "unseen hand of the market" had the ability to meet all the needs of the human family was no longer accepted.

More recently, Lord Turner, Britain's chief banking watchdog who chairs the Financial Services Authority, said that "the idea that the market prices are always—note the word always—in some efficient market sense 'correct' should have died and been buried in the recent crisis."

The experience of the 1930s led to an adaptation of the then economic order; a modified market system was introduced to lead the world out of the Great Depression.

It is generally accepted that, with the collapse of the Berlin Wall in 1989, Communism, as a dominant political and economic philosophy that had held sway over vast areas of the globe for more than 70 years, had been tested to exhaustion and had failed to meet the needs of people. That seemed to set the scene for a ritual crowning of the neoliberal economic model as the sole surviving coherent model for the world economy.

That comforting belief in turn proved to be an illusion with the crash of stock markets in 1987, followed by the Asian crisis in 1997–1998, and another a short 10 years later, the almost total collapse of the financial markets of the developed world in 2007–2008.

To avoid complete financial chaos, governments in all developed countries of necessity spent massive sums to prop up, rescue, and guarantee banks and other financial institutions. Banks, it might be noted, did not wait for the unseen hand of the market to rescue them; they instead went with begging bowls to seek government support.

Again, the preferred economic system proved to be seriously flawed, and again, individuals saw their jobs disappear and their life savings destroyed, and we witnessed the further growth of poverty. A small few escaped with great wealth, but the Great Recession of the early 21st century is a cruel reminder that our search for stable economic policies is still only a work in progress.

The Chinese example

The irony is that the developed world survived the recent collapse of its preferred economic model primarily because of the economic strength and resilience of the People's Republic of China (PRC), which operates on an entirely different economic platform. That irony still seems to be lost on many political and economic commentators, as, predictably, the moment some new thoughts emerge, the old order wants to label them in old-order terms.

David Brooks, in an article in the *New York Times*, 14 June 2010, titled "The Larger Struggle," confirms that observation. After a general introduction, he claims that the world is now divided into two camps. On one side are those who believe in democratic capitalism—ranging from the US to Denmark to Japan. People in this camp, Brooks claims, generally believe that businesses are there to create wealth and raise living standards, while governments are there to regulate when necessary and enforce a level playing field.

"On the other side," he says, "are those who reject democratic capitalism, believing that it leads to chaos, bubbles, exploitations, and crashes." (I wonder why they think that!) Instead, we are told, they embrace state capitalism. People in this camp run the Russian Federation, PRC, Saudi Arabia, Iran, Venezuela, and many other countries.

We are then informed of the good intentions of the first over the latter, the good guys over the bad guys—all simple and nicely wrapped up for presentation to a gullible world.

Brooks, to be fair, did go further and pointed out similarities and the interdependence of the two approaches.

Attendees at this conference know that, however you wish to describe the current financial system of the PRC—their own description given directly to me very recently is "socialism with Chinese characteristics"— their system has successfully lifted more people out of poverty than almost all other countries combined. The PRC is now also a banker to the world, including the US. The PRC economy has been the stable rock that the rest of the world has relied on over the last 3 years, no matter what that economy is called.

My point is not to promote the Chinese approach but to firmly note that to feed the world we must stop talking and thinking in slogans and instead acknowledge failure where it has happened, and borrow and use all systems that work. What is required is leaders who are prepared to lead the world past the dead

slogans of yesterday so as to focus on asking the right questions as to why the world economy crashed.

Recall that all the financial gurus and economic experts over the last few years seemed generally supportive of the direction of world economic policy, and none as far as we know predicted the crash. They collectively shut their eyes to any possible implication from the huge aggregation of wealth by the few and in fact were, with exceptions, silent about such growing disparities all around the world. They were silent on the fact that 80% of the world's population live in countries where income differentials are widening.

Recently, Professor Robert Wade of the London School of Economics, winner of the Leontief Prize for Economics in 2008, published some staggering facts on the last few years of the current economic model as related to the US. He noted that during the 7-year economic upswing during the Clinton presidency, 45% of the growth in pretax income went to just 1% of the public, and in the 4-year upswing during the Bush presidency, the top 1% captured an amazing 73% of the total growth and income. So by 2007, the top 1% received 23% of US disposable income, up from 9% in 1980.

Remarkably, this is exactly the same as it was in 1929, for back then, 1% had also captured 23% of disposable income. It then fell to about 10% by 1970.

Professor Wade then makes a telling point—as income polarization increased, households in the bottom 90% began to supplement their stagnant real incomes by more and more borrowing. And as they say, the rest is history.

It makes most people question the model when the chief executive officer of a large firm can receive more in a fortnight than his average worker would earn in a lifetime. No amount can ever satisfy greed.

Fortunately, not all remain indifferent, and the recent decision of the US Congress to legislate far-reaching financial reform is recognition of the need for change, and other governments are doing likewise. The leaders of the Group of 20 (G20) nations met in June 2010 in Toronto, and they agreed that going forward, the developed economies should halve their deficits over the next 3 years—a further admission that past policies and practices had failed. There was general concern expressed that cutting deficits would dangerously depress demand and potentially tip the world economy back into recession. I agree that is possible, in fact probable, if the cutting is too aggressive.

Unfortunately, there was no intimation that the G20 leaders in Toronto considered the benefits of including the 3 billion who live on less than $2.50 a day in the world economy.

At the Millennium Assembly at the UN in September 2000, there was agreement that the developed world had to do more to help the developing world. The suggested contribution of 0.7% of gross national product—only 7 cents of every $10— seems very small compared with the cost of the bailouts in the last few years. As Jeffery Sachs noted in his book, *The End of Poverty*, "The effort required

of the rich is indeed so slight that to do less is to announce brazenly to a large part of the world, 'You count for nothing.'"

"We should not be surprised, then," Sachs said, "if in later years the rich reap the whirlwind of that heartless response." I agree with Sachs, as a hungry world is an angry world.

Setting priorities right: The "people question"

We are always told it is a question of money, when in reality it is a question of priorities. This is shown by the fact that military budgets estimated by the Stockholm International Peace Research Institute reached an unbelievable $1.464 trillion in 2008 and continue to grow, as shown by the fact that military spending increased by an unbelievable 45% in the decade 1998–2008.

With so much at stake, citizens of the world have every right to ask: Have we got our spending priorities right, and are we doing all we can to reduce poverty and enhance the dignity of every person? The answer is an emphatic "No, we are not!"

Some countries and companies are not waiting and are more proactive in securing future food supplies. Those with the necessary financial resources are actively acquiring millions of hectares of productive farmland and associated water around the world. This can be seen as a modern form of colonization to gain access to today's gold, which is water.

The Asia and Pacific region is both very large and culturally diverse, and long before the world population reaches 9 billion, a major challenge facing all will be to gain acceptance of the dramatic cultural, religious, historic, and ethnic diversity that tomorrow will bring into our lives.

The coming demographic change has many aspects in addition to food sufficiency, as for the first time in history, 50% of the world's population now live in urban areas, and that percentage will grow to between 60% and 70% in about 20 years. Soon, worldwide, also for the first time in history, the number of people aged 65 and over will outnumber those aged under 5. The rapid ageing of populations in the rich, developed world will usher in profound shifts in power and politics. All this means that tomorrow will be different no matter how powerful the voices or guns of those who might wish it otherwise.

The fear of different cultures will have to change, as ageing developed societies will need immigrants, both as workers and as taxpayers. That may horrify those political leaders who constantly seek votes by vilifying refugees and migrants, but change is as certain as the setting sun. Respected author George Friedman, in his new book, The *Next Hundred Years*, a forecast for the 21st century, makes the point that, by 2030, developed countries will be competing for immigrants. Crafting immigration policy, he said, will involve not finding ways to keep them out, but finding ways to induce them to come.

In my view, the change will happen sooner than that. From my perspective, the "people question," as I call it, is going to be the most challenging issue the world faces.

All know that to have food for all, there must be reform of world trade policies, yet efforts to make progress under the World Trade Organization often seem to be an exercise in who can think up the next reason not to make progress.

We cannot discuss sufficient food for tomorrow's world without reference to climate change. I totally accept that our combined activity is having an impact on the world's climate, and action to mitigate that is urgent and necessary, which is why I spoke earlier of the positive role that science must play in food production.

I deliberately widened my brief to include the argument that we will achieve "food for all" only if leaders concentrate on building the partnerships I spoke of earlier. In today's world, where no single nation can hide and prosper alone, we must work together. Take, for example, the vast amount the world is spending on trying to reduce random terrorist attacks. No country, no matter how powerful, even pretends it can be successful operating alone, and to the contrary makes every effort to gain the cooperation of other like-minded nations.

That reaffirms what we know—that to respond to global issues requires a cooperative coordinated approach, which is exactly what the world must do if we are to put substance around the call of "food for all." There are no shortcuts. The issues we confront may be different, but the road we walk down is not new; the ambition to create a more equitable world has stretched out in front of humankind since the beginning of time.

Let me tell you of one such effort to help create a better tomorrow. A few months back, I was privileged to present the "New Zealander of the Year Award" to an English-born New Zealander, Ray Avery. Ray came from a difficult background but has achieved much in his life in terms of professional qualifications and positions. But he wanted to do more. In 2003, he founded Medicine Mondiale, a global network of experts who donate their time and skills to creating sustainable solutions to global poverty through the development of innovative medical technologies beneficial to the developing world. In addition, Ray himself has developed intraocular lenses, which at a cost of $6 each, make modern cataract surgery available to the poorest of the poor. To achieve this, Ray has established two intraocular laboratories abroad, one in Nepal and the other in Eritrea, and it is estimated that 30 million people suffering from cataract blindness will benefit from his lenses by 2020. What a remarkable achievement, the gift of sight to so many!

Let me conclude in a similar vein with good news: The issues I have discussed are not outside our ability to solve. They can all be resolved with our current state of knowledge, and as we know, the growth of knowledge continues. That should give all of us the hope and the stimulus we need to work for and, if need be, to demand progress. Reform is never for the fainthearted, and at this point in history, to succeed, reform must be extensive and broad based. You can make it happen.

Chapter 3

Country responses to food security

This chapter, based on presentations organized jointly by ADB, FAO, and IFAD at the Investment Forum, showcases the emerging experiences of four countries and one subregion in creating an enabling environment and innovative partnerships to attain sustainable food security. Their various programs feature a combination of policy reforms, institutional innovations, and strategic investments that can provide guideposts for replication. Common to all is the key thrust to reverse the trend of declining investments in the agriculture sector.

Bangladesh

Prioritizing agriculture, food security, and nutrition

Muhammad Abdur Razzaque
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The most densely populated country in the world is putting in place an investment plan that comprehensively addresses challenges to food availability, access, and utilization.

The Bangladesh government considers agriculture, food security, and nutrition as major priorities. The country has made impressive achievements over the last 30 years like tripling rice production, but it is increasingly faced with considerable challenges:

- population growth: already the most densely populated country in the world, Bangladesh is still growing by over 2 million people per year;
- climate change: sea intrusion, natural disasters, salinity;
- deteriorating access to increasingly scarce natural resources of water and land;
- vulnerability to price shocks as shown in the food price crisis in 2008;
- persistent poverty leading to poor access to food; and
- one of the highest malnutrition rates in the world.

Bangladesh considers fighting food and nutrition insecurity a key means to becoming a middle income country. Its commitment to food security matches the renewed global commitment that resulted from the 2008 food crisis and materialized in the July 2009 L'Aquila Food Security Initiative and the November 2009 World Food Security Summit in Rome. At these meetings, the global community pledged funds and committed itself to support country-led plans that would reflect investment requirements for increased food and nutrition security.

This report presents the Bangladesh Country Investment Plan (CIP) for agriculture, food security, and nutrition. It is the result of wide consultations and was extensively discussed during the Bangladesh Food Security Investment Forum on 26–27 May 2010. The CIP was endorsed by the government on 14 June 2010 as a living document that should be regularly revised and updated on the basis of evolving circumstances.

The CIP provides a coherent set of priority investment programs—12 at this stage—to improve food security and nutrition in an integrated way. It is a comprehensive plan that builds on the existing framework and reflects the government's investment priorities to (1) plan and invest resources in a coordinated way, (2) increase convergence and alignment of budget and external sources of funding, and (3) mobilize additional resources. Proposed investments relate to strengthening physical, institutional, and human capacities in the fields of agriculture, water management, fisheries, livestock, agricultural marketing, food management, safety nets, nutrition, and food safety.

The CIP is a contribution to the National Strategy for Accelerated Poverty Reduction II (December 2009). It was developed with support from the Food and Agriculture Organization (FAO) and builds on (1) the 2006 National Food Policy (NFP) and the 26 areas of intervention contained in its 2008–2009 Plan of Action and 2010 monitoring report; (2) the six thematic background papers prepared by the government, the International Food Policy Research Institute (IFPRI), and the Bangladesh Institute for Development Studies (BIDS); (3) an inventory of past and ongoing programs and projects in the respective fields; (4) relevant government planning and programmatic documents; and (5) consultations with concerned government institutions and key partners. The three components of the CIP and their related priority programs are described subsequently.

Component 1: Food availability

The three main priorities of this component are (1) sustaining the availability of key food crops, which are increasingly confronted by considerable challenges, including climate change (climatic shocks, increased salinity and sea level rise, floods), decreasing natural resources (scarce water during the dry season, land disappearing at the rate of 1% annually), and increased population pressure; (2) improving nutritional status through diversification of food production; and (3) increasing purchasing power and rural employment to enhance access to food through improved value added, agroprocessing, access to markets, and the development of rural businesses. Under the food availability component, six priority programs are identified:

Program 1: Integrated research and extension to develop and propagate sustainable responses to climate change

Agricultural research is largely underfinanced in Bangladesh. The priority of the government is to enhance the capacity of research institutes and regional stations to respond to climate change by developing human and technical capacities, improving international cooperation (to access available varieties that could be useful in Bangladesh), and increasing yields of new varieties of rice and other crops. In particular, improved varieties should be either imported and adapted or developed in-country around the following requirements: higher yields; shorter

maturity (to increase crop intensity and reduce the risk of drought for aman or summer/rainfed rice); drought tolerance or low water consumption; tolerance to moderate flood levels, salinity, or arsenic uptake; and resistance to floods and waterlogging.

Another challenge will be to find incentives to lure back expatriate researchers. Besides rice, another priority is to diversify crop production, particularly vegetable production in the south.

Another area of investment is to contribute to the implementation of the National Agricultural Extension Policy and the Bangladesh Climate Change Strategy and Action Plan. Proposals should build on both the extension and research components of the National Agricultural Technology Project. The government also emphasizes the need to develop information and communication technology-based extension and agricultural marketing services and to build capacities of facilitators and trainers to provide advice and necessary support through the farmer field school (FFS) approach.

Still another area of investment is research and development (R&D) in agricultural practices and farming systems for adapting to and mitigating climate change by combining appropriate cultivars, cropping patterns, and land and water management practices. Conservation agriculture and integrated pest management or integrated crop management, which contribute to more sustainable and resilient farming practices, will also be promoted.

Improving education for agriculture, fisheries, and livestock husbandry is another important priority. Efforts should be made to develop a trained agriculture workforce, establish small farms with training centers at local levels, and ensure incentives to retain the skilled workforce in agriculture.

Program 2: Improved water management and infrastructure for irrigation purposes

Bangladesh has a very rich and complex history of irrigation development over the past decades, which has contributed to remarkable crop intensification, e.g., tripling rice production largely as a result of irrigated *boro* (winter) rice. The country intends to invest in integrated water management measures to address three major challenges: (1) climate change, which has induced seawater intrusion and increased salinity; (2) decreasing water resources and incoming flows, which affect the south during the dry season; and (3) access to irrigation water, especially for the food-insecure southern part of the country.

The government has identified some key priority investment proposals: (1) reduce water losses in existing schemes through improved water management (capacity building of water management cooperatives); (2) develop water-saving techniques or rehabilitate existing schemes to increase water use efficiency from the current 27%; (3) develop surface irrigation in the southern part of the country, possibly using Asian Development Bank (ADB)- and International Fund for Agricultural Development (IFAD)-supported projects implemented by the Ministry

of Local Governments; (4) partly reduce reliance on deep-well irrigation in the northern part of the country to increase availability in the south; (5) reduce costs and mitigate the risk of arsenic contamination; (6) rehabilitate dikes, embankments, and other structures affected by previous cyclones to protect vulnerable households and the production base against saline water intrusion in the extreme south; (7) improve drainage, saline intrusion control, and flood management; (8) step up institutional reform and improve the regulatory framework; and (9) increase river water flow to the south, particularly with a major dredging effort on the Gorai River.

Program 3: Supply and sustainable use of agricultural inputs

The clear focus of the government is on the seed sector. While most of the improved seeds purchased by farmers are either produced by the private sector or imported, the government intends to reinvest in increased public involvement in the production of basic seeds for food crops and to develop partnerships with seed growers for community-based seed multiplication. The Bangladesh Agricultural Development Corporation (BADC) will perform this role. However, BADC needs to raise its capacity to produce basic seeds (with the help of research centers) and organize contracting for seed multiplication, seed cleaning, packaging, and marketing. The government has specific actions in mind, including developing a new seed farm on a well-identified *char* (island of silt within a river) in the south that is managed by BADC. There is also a need to strengthen facilities and equipment for seed certification and seed quality testing.

Restoring soil fertility is also a major priority. Fertilizers are used extensively in Bangladesh. They are subsidized in various degrees, and their distribution is partly controlled by the government. While subsidies are not part of the CIP, this could cover other requirements, like improving the distribution system, particularly the creation and management of adequate buffer stocks and storage facilities; improving fertilizer use efficiency and balanced use through propagation of fertilizer deep placement at the farmers' level; putting in place a medium-term demand assessment mechanism; reviewing underperforming fertilizer manufacturing units, and facilitating modernization; evaluating the costs and benefits of subsidy programs to improve efficiency; and facilitating the establishment of a National Fertilizer Commission responsible for an integrated approach to the planning and monitoring of the fertilizer sector.

Program 4: Fishery development program

Complementary to the IFPRI/BIDS report, the Ministry of Fisheries and Livestock (MoFL) has prepared the Country Investment Plan for Fisheries Resource Development (2010–2015) with three priorities for investment:

- Improve the management of inland and marine fisheries resources, including the restoration of some open water capture fisheries, which will require (1) stronger institutional arrangements and strengthening capacities

for coordinated management involving users and communities; (2) the development of community-based resource management, including support for fish sanctuaries through training, technical assistance, and access to inputs and credit; and (3) the potential development of community-based open water aquaculture-based fisheries.

- Restore habitats through reexcavation of degraded water bodies, establishment of sanctuaries in suitable water bodies, amendment of existing leasing policy from being revenue oriented to biological management through public investment and community mobilization, and conservation of hilsa fishery and alternative income generation for jatka fishers.
- Increase productivity for small-scale inland aquaculture by (1) developing low-cost aquaculture technologies specially for smallholder farmers and linking aquaculture business with an insurance system; (2) improving hatchery management practices and genetic quality of potential fish species; (3) strengthening R&D focused on the needs of small farmers and opportunities to include micronutrient-dense small fish in culture systems; (4) improving public and private advisory services for smallholder farmers willing to invest in aquaculture by designing systems to integrate aquaculture with crop systems at the farm level; (5) providing advice and facilitating access to quality inputs (fingerlings, adequate feed) and credit for business development; (6) enhancing commercial aquaculture productivity under a public–private partnership; and (7) investing in the reversal of genetic degradation in carp and other farmed fish species.

Program 5: Livestock development program

MoFL has also developed the Road Map to the Country Investment Plan for Agriculture, Food Security, and Nutrition with Proper Livestock Resource Management. The program is designed to fill the dramatic gap between the national supply of the most important sources of animal proteins (milk, eggs, meat) and nutritional requirements. The list of priorities is long, but a few have emerged: (1) strengthening animal health through the development of community-based animal health care, improved disease control and surveillance systems, disease diagnosis equipment, etc.; (2) capacity building at the herder level through strengthening FFSs as a means to improve husbandry and feeding practices and access to quality feed, and promoting producer organizations to enhance value chain efficiency and market access; (3) investing in a systematic cattle and buffalo genetic improvement program to take advantage of the multipurpose potential of large ruminants for milk, meat, draught; and (4) private sector development of diversified vaccine production and marketing.

Program 6: Access to markets, improved agricultural value added, and increased nonfarm incomes

The program aims to (1) facilitate access to markets by producers to increase their incomes, (2) reduce losses and wastage, (3) add value to agricultural produce, (4) reduce transaction costs and increase consumption of diversified foods to improve nutrition, (5) promote and support the development of small-scale processing units and off-farm activities, and (6) create rural employment.

A number of priority investments have been identified that could form the program, including (1) construction and adequate maintenance of rural roads to facilitate marketing of products and access to services, particularly in remote areas; (2) construction or rehabilitation of rural infrastructure, including the supply of potable water, drainage, and storage facilities; (3) improvement and rehabilitation of wholesale markets in major cities; (4) capacity building and training for group marketing at the community level; (5) training in food quality and safety regulations and requirements to comply with market requirements; (6) private sector provision of storage facilities to reduce losses and increase value added; (7) value chain analysis and facilitation; (8) setting up integrated and real-time information on market prices, requirements, and opportunities through electronic and telecommunication means; (9) development of and access to advice, credit, and markets for small-scale processing enterprises particularly suitable to rural women; (10) technical and managerial advice and business planning support for nonfarm activities; and (11) mentoring of rural entrepreneurs (access to technical support, credit, and markets).

Component 2: Food access

The priorities are twofold. First, as right to food is the basis behind the NFP, the government has adopted different approaches to enhance food access in normal years as well as in times of steep price increases and natural disasters. Capacity strengthening and an enhanced public food management system are thus of considerable importance. Second, the CIP will also finance the development of an integrated multiyear safety net program that will build on and improve the effectiveness and targeting needs of existing scattered programs.

Program 7: Capacity strengthening for food policy and CIP formulation, implementation, and monitoring

The NFP capacity-strengthening program is currently developing the capacity of the Ministry of Food and Disaster Management (MoFDM), particularly the Food Planning and Monitoring Unit, to coordinate and monitor policy implementation. This program will focus on strengthening food security policy formulation, monitoring and evaluation, impact assessment, and investment cycle management. This will be complemented by strengthening early warning systems to mitigate the impact of shocks on food security.

Program 8: Enhancing public food management systems

Public food management involves building food stocks through domestic procurement, imports, and food aid as well as the management, inspection, and distribution of food stocks. Public food stocks serve at least four purposes: (1) act as an important instrument to provide incentives to farmers, (2) ensure adequate supplies for routine distribution under the public food distribution system, (3) stabilize/reduce prices for poor consumers and ensure emergency relief, and (4) provide resources for food-based safety nets. In short, public food stocks serve to ensure food security of various target groups including in times of crisis. This system is designed to reduce the vulnerability of Bangladesh to external shocks and their impact on food access, including ensuring "price security" through public food management.

The government has identified the following investment areas: (1) increasing public grain storage capacity; (2) accelerating the computerization of the food stock/storage monitoring system down to the field level to improve its efficiency and management, and to reduce losses; (3) expanding the capacity building of MoFDM's Food Division and Directorate of Food to handle public food distribution systems; (4) enhancing quality control through establishment of laboratories down to the district level; (5) acquiring modern testing equipment and developing guidelines, standards, and grading systems; and (6) strengthening capacities to undertake training and operational research.

Program 9: Developing an integrated multiyear safety net program

Bangladesh has an elaborate system of social safety nets (SSNs) operated by 13 ministries and some nongovernment organizations (NGOs) covering various target groups. Some of these programs are food based, some are cash based, and some are both food and cash based. They aim to ensure income security as a means to poverty reduction and adequate access to food. A major problem that has beset these programs is mistargeting, i.e., exclusion of eligible beneficiaries and inclusion of noneligible ones. The multiplicity of programs has also led to some inefficiencies and less than optimal use of resources.

In this context, and based on a comprehensive review undertaken during the past years, it is proposed to develop an ambitious multiyear program with a view to improving the targeting performance of SSNs to reach the most food insecure in the country and to streamline and coordinate current SSN activities. This program should involve partnerships with NGOs that are heavily involved in SSN initiatives. Attempts will also be undertaken to improve synergies between SSN programs and productive infrastructure (food or cash for work) such as those for irrigation, rural transport, and markets. The program will also finance capacity building at various levels to improve the management of these SSN programs. The institutional and human capacities of the Disaster Management and Relief Division, which currently implements 80% of all SSN programs, should also be strengthened.

Targeting effectiveness needs to be improved to ensure that the benefits of the programs reach the poorest and the food insecure. Commissioning of pilot programs in pilot areas following the improved mechanism is also needed. Complementary feeding and nutrient supplementation should be integrated in SSN programs. Finally, cost effectiveness of means-tested versus geographic targeting for different population segments or geographical locations will be defined through research and simulation.

Component 3: Food utilization

Two priorities have been identified: First is substantially improving the nutrition status of the malnourished population, including the most vulnerable such as children under 2 years old and pregnant and lactating women. Bangladesh has the highest prevalence of malnutrition in the world. Millions of children, adolescents, and pregnant and lactating women suffer from one or more forms of malnutrition including low birth weight, stunting, underweight, vitamin A deficiency, iodine deficiency disorders, and anaemia. Malnutrition contributes to more than 50% of child deaths. There is a pressing need to invest in both treatment and prevention of malnutrition.

Second, food safety is an essential public health function for Bangladesh. Food and waterborne diarrheal diseases are leading causes of illness and death and cause great human suffering and economic losses. There is a need to implement a program to improve food safety and quality for consumer health and nutrition and to develop a comprehensive policy, strengthen capacities of existing institutions, strengthen consumer protection, and build on ongoing food safety activities.

Program 10: Developing community-based nutrition activities through livelihood approaches

This program proposal complements the Bangladesh Integrated Nutrition Project, which started in 1995 and was followed by the National Nutrition Programme in 2001. This strategy will include linking agriculture and food-based nutrition with health-based capacity development nutrition interventions such as awareness campaigns on exclusive breastfeeding, promotion of complementary feeding, and the prevention of malnutrition through distribution of or access to vitamins and other nutrients. Actions in the long run should be complemented by the immediate treatment of acute malnutrition in the concerned communities in collaboration with the health sector.

Program 11: Orienting food and nutrition programs through updated food consumption and food composition data and behavioral change communication on dietary diversification

Key information is required to orient nutrition policies and programs. An updated and comprehensive food consumption survey is essential to inform program implementers about actual food and nutrient intakes, identify nutritional gaps,

set targets, and influence a number of the CIP programs on food availability. Similarly, in the context of the recent introduction of high-yielding varieties adapted to climate change and crop diversification, an update of food composition tables is needed to fill important gaps to orient efforts in the research, extension, and production of improved seeds. A dietary diversification study and the creation of advocacy, awareness, and nutrition education through nutrition and health behavioral change communication are also proposed. The national nutrition survey is necessary, because the last available data are for the period 1995–1996.

Program 12: Improving food safety and quality for consumer health and nutrition

The formulation of a national food safety and quality policy and the elaboration of a comprehensive plan of action are essential efforts to improve both the public health and the nutritional status of the population. Currently, there is no specific or comprehensive policy on food safety. Other needs include gathering reliable surveillance data on foodborne illnesses, the development of evidence-based interventions, as well as the establishment and expansion of sentinel/pilot sites for surveillance of foodborne illnesses. The current legislative instruments controlling food safety and quality are likewise in urgent need of overhaul.

The National Food Safety Advisory Council, created in 2005, has only recently been reconvened to oversee food safety, and its mandate and authority are yet to be fully explored. The absence of a well-equipped and -resourced national food analysis laboratory is a critical deficiency, and efforts to establish such a facility are under way but will require technical and administrative support so it may expand its role and functions.

FAO is assisting Bangladesh in the areas of food safety policy development, food control management, preventive approaches for food safety, food inspection and enforcement, and food analysis. These activities need to extend beyond the project period (June 2012) to meet the ongoing capacity development needs and to facilitate comprehensive food control activities that address the entire food supply chain. Planning, establishment, and development of a national food control authority are considered essential, and the development of a management model for overseeing food safety and quality should be examined, including the possibility of setting up a dedicated unit overseeing food control.

Table 1 summarizes the main features of the various components of the CIP.

Preliminary costs and financing requirements

At this stage, only preliminary costing of the proposed CIP could be undertaken. More detailed cost estimates of the respective programs will require in-depth design work, which will occur during a second phase once potential sources of financing have been identified so that actual preparatory work for specific programs can be jointly initiated between the government and the specific financiers. The CIP cost

has been estimated at about $10.1 billion over 5 years, of which $3 billion will be financed from the budget, leaving a gap of $7.1 billion.

Coordination and monitoring and evaluation

The coordination of the formulation and implementation of the NFP and its Program of Action has been the responsibility of the Food Policy Working Group and, on a day-to-day basis, of the Food Planning and Monitoring Unit (FPMU) of MoFDM. While implementation of the CIP programs will be the responsibility of the respective ministries and other agencies and actors, its coordination and overall monitoring and evaluation will be carried out as per the Rules of Business of the Government and Allocation of Businesses to the Ministries. However, it is proposed that FPMU continue to play this role by expanding its capacities in investment programming and monitoring and by associating with other government agencies that will be involved and for which the respective roles should be further refined, including the Planning Commission and the Ministry of Finance. For strategic guidance, the government intends to set up an Interagency Steering Committee to oversee and coordinate the implementation of the CIP.

Proposed next steps: A road map toward investment

One of the sessions in the Bangladesh Food Security Investment Forum in May 2010 was dedicated to the presentation of the draft CIP to receive feedback from the participants. Based on the results of the forum and the inputs from the participants, the recommended next steps include further building of inclusive partnerships to develop and implement specific CIP programs, and preparing detailed programs once specific financing institutions have demonstrated a commitment to financing elements of the CIP (e.g., the Global Agriculture and Food Security Program in the short term).

The preparation of these programs will require (1) in-depth review and stock-taking of ongoing projects and programs; (2) careful technical design and assessment of the proposals; (3) social and environmental assessment, if required; (4) careful costing and a financing plan, including the identification of financing gaps; (5) financial and economic cost–benefit analyses; (6) a comprehensive monitoring and evaluation system; (7) capacity-strengthening activities based on assessments of institutional capacities; (8) identification of policy issues to be addressed during preparation or implementation; and (9) a clear implementation plan and procedures.

The role of development partners

Initial support to the government in this process has come from the United States Agency for International Development (USAID), IFPRI, BIDS, the European Community, the Department for International Development of the United

Table 1: Various components of the Bangladesh Country Investment Program (CIP)

Component	Program Number	Program Title	
Food Availability	1	**Integrated research and extension to develop and propagate sustainable responses to climate change**	
	2	**Improved water management and infrastructure for irrigation purposes**	
	3	**Supply and sustainable use of agricultural inputs**	
	4	**Fishery Development Program**	
	5	**Livestock Development Program**	
	6	**Access to markets, improved agricultural value added, and increased nonfarm incomes**	

ADB = Asian Development Bank, ASPS = Agriculture Sector Program Support, BADC = Bangladesh Agricultural Development Corporation, BARC = Bangladesh Agricultural Research Council, BWDB = Bangladesh Water Development Board, DAE = Department of Agricultural Extension, Danida = Danish International Development Agency, DFID = Department for International Development of the United Kingdom, DGoF = Directorate-General of Food, EU = European Union, FAO = Food and Agriculture Organization, FPMU = Food Planning and Monitoring Unit, IDB = Islamic Development Bank, IFAD = International Fund for Agricultural Development, INFS = Institute of Nutrition and Food Science, MoA

	Proposed Focus and Priority Interventions	Main Institutions and Development Partners Involved	Indicative Cost ($ million)
	1. Enhance research to adapt to climate change 2. Develop community-based learning and experimentation practices (expand farmer field school programs) 3. Promote sustainable agriculture practices (conservation agriculture, integrated pest management or integrated crop management)	BARC, DAE, BADC, ASPS, NATP, IFAD, FAO, DANIDA, DFID, ADB, BWDB	1,559
	1. Improve water management at farm level (capacity building for water users, rehabilitation of infrastructure) 2. Increase surface irrigation in the south and reduce deep-well pumping in the north 3. Protect infrastructure rehabilitation against sea intrusion 4. Step up Gorai River dredging to increase water flow to the south	MoWR, BWDB, MoLG, MoA, BADC, WB, ADB, IFAD, Dutch Coop.	1,186
	1. Build partnerships (BADC, private sector) for improved /stress-tolerant seed multiplication 2. Build capacities for seed quality, testing, and certification 3. Improve and undertake more rationale use and quality control of fertilizers	BADC, Private Sector, NATP, FAO, DANIDA	624
	1. Restore some of the inland open water fisheries 2. Develop small-scale inland aquaculture 3. Provide quality enhancement and certification for shrimp culture	MoFL, FAO, JICA, IFAD, WB, Danida	1,091
	1. Strengthen animal health services 2. Capacity building and training at herder level, and feed processing 3. Cattle and buffalo genetic improvement activities	MoFL, ADB, Danida, WB, FAO, IFAD	624
	1. Improvement of rural roads and markets 2. Group marketing and training at community level 3. Private storage, value chain facilitation, information provision 4. Assist the development of off-farm activities and rural businesses	MoA, MoFL, IFAD, Danida, ADB, IDB	1,082

= Ministry of Agriculture, MoFDM = Ministry of Food and Disaster Management, MoFL = Ministry of Fisheries and Livestock, MoHFW and MoH = Ministry of Health and Family Welfare, MoLG = Ministry of Local Government, MoWR = Ministry of Water Resources, NATP = National Agricultural Technology Project, NFSAC = National Food Safety Advisory Committee, UNICEF = United Nations Children's Fund, USAID = United States Agency for International Development, WB = World Bank, WFP = World Food Programme, WHO = World Health Organization.

Table 1: Various components of the Bangladesh Country Investment Program (CIP) *(continued)*

Component	Program Number	Program Title	
Food Access	7	**Capacity strengthening for food policy and CIP formulation, implementation, and monitoring**	
	8	**Enhancing public food management systems**	
	9	**Developing an integrated multiyear safety net program**	
Food Utilization	10	**Developing community-based nutrition activities through livelihood approaches**	
	11	**Orienting food and nutrition programs through data**	
	12	**Inproving food safety and quality for consumer health and nutrition**	

ADB = Asian Development Bank, ASPS = Agriculture Sector Program Support, BADC = Bangladesh Agricultural Development Corporation, BARC = Bangladesh Agricultural Research Council, BWDB = Bangladesh Water Development Board, DAE = Department of Agricultural Extension, Danida = Danish International Development Agency, DFID = Department for International Development of the United Kingdom, DGoF = Directorate-General of Food, EU = European Union, FAO = Food and Agriculture Organization, FPMU = Food Planning and Monitoring Unit, IDB = Islamic Development Bank, IFAD = International Fund for Agricultural Development, INFS = Institute of Nutrition and Food Science, MoA

	Proposed Focus and Priority Interventions	Main Institutions and Development Partners Involved	Indicative Cost ($ million)
	1. Strengthen and expand capacity to implement, monitor, and coordinate National Food Policy–Program of Action 2. Strengthen the capacity to formulate, implement, monitor, and coordinate the CIP programs	Food Division/ MoFDM, FPMU, DGoF, USAID, EU, FAO	107
	1. Enhance efficiency of public management systems (improve operational procedure, adopt ICT and computerization, develop operation research) 2. Build capacities of MoFDM and Directorate of Food to manage the food system 3. Increase and modernize public storage and handling facilities 4. Strengthen capacity of quality control of food and foodstuffs	Food Division/ MoFDM, DGoF, EU, WFP, DFID	625
	1. Formulate new comprehensive safety net programs, streamlining the existing safety net programs, and enhancing their impacts 2. Redesign, streamline safety net programs in partnership with stakeholders 3. Improve institutional capacity to effectively operate social safety net programs	MoFDM, WFP, EU	1,665
	1. Build on and complement the National Nutrition Programme 2. Assist rural communities to develop their own nutrition activities through a livelihood approach, complemented by health-oriented awareness campaigns 3. Provide support to develop gardens, small animals, behavior changes, etc. 4. Link long-term with immediate treatment of acute malnutrition	MoHFW, MoA, MoFL, MoFDM, EU, WB, FAO, UNICEF	1,254
	1. Update food consumption survey, food composition tables 2. Work out updated nutrition messages and develop capacities	Food Division/ FPMU, MoH, INFS, EU, WFP, UNICEF, FAO	50
	1. Improve surveillance system of foodborne illnesses 2. Enhance capacities and laboratories for food control and safety	Food Division/ DGoF/FPMU, MoH, NFSAC, EU, WHO, FAO	187

= Ministry of Agriculture, MoFDM = Ministry of Food and Disaster Management, MoFL = Ministry of Fisheries and Livestock, MoHFW and MoH = Ministry of Health and Family Welfare, MoLG = Ministry of Local Government, MoWR = Ministry of Water Resources, NATP = National Agricultural Technology Project, NFSAC = National Food Safety Advisory Committee, UNICEF = United Nations Children's Fund, USAID = United States Agency for International Development, WB = World Bank, WFP = World Food Programme, WHO = World Health Organization.

Kingdom (DFID), Danish International Development Assistance (Danida), and FAO. It is essential that all the main development partners active in the agriculture and food and nutrition sectors are increasingly involved to contribute their vast experience and ideas and progressively support government efforts to develop a coherent investment plan for agriculture and food that is built on consensus. This is particularly the case for multilateral financing institutions (ADB, the World Bank, IFAD, the Islamic Developlment Bank), the main bilateral agencies (USAID, the European Union, Danida, Japan, and DFID), as well as for United Nations agencies playing a more technical role (FAO, the World Food Programme, the United Nations Children's Fund, the United Nations Development Programme, and the World Health Organization). Existing coordination mechanisms of development partners should be used to organize multidonor support for the CIP.

People's Republic of China

Steering development orientation as a driver of change

Zhou Qijiang
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Foreign Economic Cooperation Center
Ministry of Agriculture
People's Republic of China

To feed about 22% of the world's population with about 9% of the world's arable land, the People's Republic of China is dedicated to employing a strategy mix to achieve food self-sufficiency.

Due to constrained resources, climate change, yield stagnation, population growth, and other factors, the world's food supply cannot meet general demand, and regional imbalance becomes very common in terms of food supply. Developing countries may face more pressing food security problems than developed countries. As a life necessity and industrial raw material, food is an important commodity for both national well-being and people's livelihood, and bears great strategic significance.

Ensuring food security is not only the focus for governments all over the world; it is also a major development strategy adopted by the People's Republic of China (PRC) to promote economic development, maintain social stability, and achieve national self-sufficiency. As the representative of the Ministry of Agriculture, I will share with you the PRC's practical experience in and development orientation for securing national food security.

Current status of the PRC's food security

The PRC is one of the world's major grain producers and consumers, feeding about 22% of the world's population from about 9% of the arable land of the world. Its food self-sufficiency rate has been kept above 95% of the country's grain requirement for a long time. The government attaches great importance to agriculture and food production, having issued a series of policies in favor of farmers, and having strengthened macroeconomic regulation to promote the steady development of food production. These coordinated actions have served as effective insurance for national food security, with the following results:

- **Grain production has enjoyed stable development.** Since 2003, the PRC's grain output enjoyed growth for 6 consecutive years and stayed above 500 billion kilograms (kg) for 3 consecutive years. In 2009, the grain sown area reached 1.635 billion mu (1 Chinese mu = 1/15 of a hectare), with a total grain output of 530.8 billion kg and a yield of 324.7 kg/mu.
- **Food consumption has shown continuous growth.** Food consumption demand in 2009 was 521 billion kg, 20 billion kg more than in 2005 and increasing by about 5 billion kg per year. Rice consumption reported a steady increase at 0.4%, while maize consumption enjoyed rapid growth at 10% and soybean consumption at 20%.
- **People's dietary structure has improved.** Chinese citizens' per capita share of agricultural products has improved significantly. In 2008, the per capita share of grain was 399 kg; oil, 22.3 kg; pork, beef, and mutton, 40.3 kg; aquatic food, 37 kg; and milk, 26.8 kg. As the dietary structure became increasingly diverse and the quality improved, the capacity to ensure a balanced supply also went up along with significant improvements in the people's nutritional condition.

Overall, the PRC has always adhered to the principle of domestic food self-sufficiency, and under the policy support system, it makes great efforts to increase food production to meet food consumption growth and structural adjustments in diet to thereby ensure national food security.

Government support for securing national food security

To ensure food security through support for food production, the PRC has taken a series of measures that are conducive to food development. These include a range of policy and investment measures that boost productivity and production, such as research and development for improved technology, and provisions for support infrastructure, market facilities, equipment, and extension services.

The main lessons we have learned include the following:

Treat farmland protection as long-term fundamental national policy. About 1.8 billion mu of cultivated land is not only the bottom line for ensuring the country's grain self-sufficiency but also the basic resource for food security. To this end, the PRC has established the basic farmland protection system and implemented the most stringent measures to ensure that the quality of land resources is sustained from the system perspective. At the same time, the quality of cultivated land is being improved as farmers and rural collectives are encouraged to increase land-enhancing inputs. Through these combined measures, soil fertility and agricultural productivity are improved.

Intensify policy support for self-sufficiency. Since 2004, the PRC has abolished all agricultural taxes and increased funding year by year for the "Four Subsidies"—Grain Direct Subsidy, Varieties Subsidy, Farm Machinery Purchase

Subsidy, and General Subsidies for Agricultural Production Supplies. Subsidy support was increased to nearly 140 billion yuan in 2010 from 14.5 billion yuan in 2004, and the national average subsidies for grain fields increased to more than 70 yuan per mu from less than 10 yuan. Meanwhile, under the minimum grain purchase price system, the purchase price has witnessed continuous increase. Since 2005, the minimum purchase price of various major grains has increased by 25%–40%, and interim storage measures have been taken for maize and soybean to stabilize their prices.

Accelerate infrastructure construction. In 2008, the central government spent more than 120 billion yuan for stepping up rural infrastructure construction. This included 2.4 billion yuan for the High Quality Food Industry Project and the Large Merchandise Grain Base Construction Project. Under the former, launched in 2004, great importance has been attached to development of high-quality and special seed breeding, grain pest prevention, standard grain field construction, and modern farm machinery and equipment. By the end of 2008, 6.35 billion yuan had been invested, 1,502 construction projects finished, and more than 1,600 mu of standard grain fields cultivated. Under the Large Merchandise Grain Base Construction Project, by the end of 2008, the central government had invested 4.3 billion yuan and constructed more than 70 large merchandise grain bases in 12 provinces, including Hebei, Inner Mongolia, Liaoning, Heilongjiang, and Jilin.

Strengthen scientific and technological support capability. In 2009, the super rice area reached more than 8,500 mu, with the average yield increasing by more than 5%. High-yielding and density-tolerant maize varieties were planted on more than 100 million mu, accounting for 25% of total maize lands. Expert-recommended wheat varieties were planted on 110 million mu, accounting for 33.3% of total wheat lands. Great efforts have been taken to promote the breeding of plants tolerant of drought and rarefied air, seedling tossing, cultivation of super high-yielding rice, precise and semiprecise wheat sowing, later application of nitrogen fertilizer, increasing maize plant density, plastic membrane mulching, subsoil tillage, sowing with water in big-ridge and double-row modes, as well as a number of other high-yielding cultivation techniques to increase grain production.

Speed up agricultural mechanization. In 2008, the national gross agricultural machinery power reached 820 million kilowatts (kW), and the comprehensive mechanization level of main crops, such as mechanical plowing, sowing, and harvesting, reached 45.9%, of which the gross agricultural machinery power of the farming cultivation system was 18 million kW. The supply of agricultural machinery and equipment has maintained continuous growth. Additionally, the agricultural machinery extension service has also witnessed further development and has become an important material support for national food security.

Improve storage and logistics. Interregional trade in grain should be promoted. Nationally important food transport hubs and food depots should be constructed, and large-scale cross-regional grain logistics enterprises fostered. The

grain and oil reserves and control system integrating central strategic and special reserves with reserves for circulation, adjusting central reserves with local reserves, and government reserves with minimum inventory of enterprises and businesses, are being continually improved to strengthen the country's grain reserve management capacity.

Challenges confronting the PRC's food security

The accelerating pace of industrialization and urbanization, coupled with greater access to information technology in the PRC, may endanger food security as the food security situation becomes more complex. This in turn puts heavy responsibility on guaranteeing food security. The food security situation is affected by three irreversible situations and two increasing trends that all have implications for ensuring the country's sustainability.

With the rise in incomes, increasing demand for diverse food choices and improved food quality is irreversible. It is predicted that food demand in the PRC will amount to 525 billion kg in 2010 and 572.5 billion kg in 2012. The demand for table food and seeds is relatively stable, while the demand for feed and for food crops for industrial use shows an irreversible upward trend. The demand for rice and wheat is hardly increasing, while the demand for maize and soybean is growing rapidly.

Tightening constraints on resources such as farmland are irreversible. There was 1.826 billion mu of farmland in the country in 2008, which was 120 million mu less than in 1996, with an annual reduction of 12 million mu on average. At present, the farmland per capita is 1.38 mu, only 40% of the world average. The water resource per capita is 2,200 cubic meters (m^3), which is a quarter of the world average. The PRC is one of the top 13 countries that are extremely short of water, with a projected 30 billion m^3 shortage for agricultural production each year.

Global warming is irreversible. In the past century, the global average surface air temperature (SAT) rose by 0.74°C, while the average SAT in the PRC went up by 1.1°C. Global warming has adverse effects on agricultural production, resulting in more frequent extreme weather and irregular pest occurrence, greatly affecting the farming system. In addition, global warming will aggravate soil fertility degradation and increase the use of pesticides and fertilizers.

The impact of globalization on agriculture is increasing. Globalization enhances the links between agriculture and the international market, and strengthens the connections among different industries. This, however, has greatly impacted prices in the domestic economy. Of specific concern is the rising impact of imported farm products such as soybean grain and oil and some other inputs highly dependent on foreign sources. The entry of foreign investments in agriculture and other areas, such as staple crop processing, storage, and transportation, is also generating more and more concern.

The expanding economic uses of grains add increasing pressure on food security. With fossil fuels drying up, grain-based ethanol is becoming the new trend. Biofuel yield tripled from 2000 to 2008. Between 2007 and 2008, 10% of coarse grains in the world or about 110 billion kg was used to produce ethanol. The rapid growth of biofuels is boosting the demand for coarse grain as well as other raw materials for its production, which has, however, resulted in shrinking resources for grain production. Biofuels are becoming a menace to the food grain supply.

Road ahead: Aims and guarantees for the PRC's food security

With increasingly complex food security situations on both the domestic and international fronts, the long-term priority of agricultural development in the PRC will be toward improving the comprehensive capacity of agricultural production, guaranteeing the effective supply of major agricultural products, and ensuring national food security.

According to the country's Long-Term Planning Overview for National Food Security (2008–2020), its specific goals for food security are to (1) maintain a minimum 1.8 billion mu of farmland and at least 1.26 billion mu of grain farms nationwide by 2015; (2) maintain a minimum grain self-sufficiency rate of 95%, and enable a comprehensive grain production capacity of beyond 530 billion kg by 2015; (3) maintain a reasonable amount of grain reserves; and (4) ensure that at least 40% of the grain follows the "4 in-bulk" process of loading, unloading, storage, and transport in bulk.

To realize the above goals, the PRC will further upgrade irrigation systems and improve medium/low-yielding fields, promote improved varieties and high-yielding cultivation techniques, modify farming systems to develop and make full use of limited resources, promote advanced and applicable agricultural machinery and supporting technologies to expedite the mechanization process of grain production, and pay attention to pest prevention and control to minimize losses.

On the institutional and policy levels, the government will implement the following measures:

Implement the most rigorous farmland protection system. The bottom line of 1.8 billion mu of farmland will be firmly held, and efforts will be made to continuously improve soil fertility. Protection and compensation mechanisms will be established to ensure that the basic farmlands will not be reduced, their uses will not be changed, and their quality will be improved.

Step up construction of agricultural infrastructure. The National Plan of Additional 50 Billion kg Grain Project will be accelerated. The inputs for grain production will increase substantially through enhanced investments in the Seed Project and the Plan Protection Project. Current projects such as the Comprehensive Agriculture Development Project and the Land Consolidation Project will favor the major grain-producing areas, with improved construction standards.

Improve the system of subsidies and rewards for food production. The comprehensive agricultural direct subsidy and price dynamic adjustment mechanism will be improved. The coverage of subsidy for improved varieties will be increased and standards raised; the subsidy for purchasing agricultural machinery will be further scaled up; more subsidies and fiscal rewards will be given to large grain-producing farmers and counties, respectively. A unified professional service for purchasing, supplying, distributing, and spraying pesticides will be actively explored.

Improve the adjustment mechanism of the food market. The minimum purchase price for grain will be steadily increased; a subsidy system for target food price will be explored and built to combine the price support policy with the income subsidy policy. Further, monitoring of grain production, consumption, import/export, and storage/transportation will be enhanced by establishing an early warning and monitoring system. Supervision of foreign investments in grain circulation and processing will be strengthened.

Increase inputs for agricultural technology. Emphasis will be put on addressing technical problems that can reduce grain production, such as breeding and pest control. More efforts will be made to enhance the innovation capability of agricultural research institutes and regional research centers. Institutional innovation and capacity development in the promotion of agricultural technology will also be accelerated. The subsidy fund for high-yielding grain and oil will be scaled up to promote concentrated roll-out of technologies and increase the technology adoption rate.

Moving forward

The PRC's development is closely tied up with global development. The country's food security is also increasingly relevant to the food security of the Asia and Pacific region and even to that of the world. The PRC's achievements in sustaining its food security may be attributed to the long-term support provided by international financial institutions such as the Asian Development Bank (ADB), Food and Agriculture Organization (FAO), and International Fund for Agricultural Development (IFAD) as well as our own efforts.

Based on different multilateral and bilateral cooperation frameworks, such as PRC–Association of Southeast Asian Nations (ASEAN), the Greater Mekong Subregion, and the Asia–Pacific Economic Cooperation (APEC), and by using the Special Fund for Asian Regional Cooperation, PRC–ASEAN Cooperation Fund, and Special Fund for International Communication and Cooperation in Agriculture, the PRC has successfully implemented several food security–related technical assistance operations. These include those for hybrid rice planting, livestock breeding, economic grain extension, and new rural energy exploration. In the last decade, the Ministry of Agriculture has provided more than 100 million yuan and implemented more than 150 projects with ASEAN countries for human

resources development, technology demonstration and extension, academic and technology communication, and economic and trade promotion.

Two successful cases are worth highlighting: First is the bilateral cooperation between the PRC and the Philippines. Our respective agricultural technology centers collaborated in hybrid rice breeding and small agricultural machinery extension. Second are the investments of the Longping High Technology Company in the Philippines, which is a showcase of a successful enterprise experience from the overseas development perspective.

To foster stronger regional food security, partnerships with development agencies like ADB, FAO, and IFAD as well as other stakeholders will be needed. We suggest some areas for starting this partnership for regional food security.

First, special studies financed by ADB and other development agencies will be needed and should be encouraged.

Second, under the current multilateral cooperation framework, actions for regional cooperation need to be promoted such as the ASEAN Integrated Food Security Framework.

Third, bilateral cooperation in the Asia and Pacific region is the foundation for the PRC's development in food security. Hence, south–south cooperation is necessary for the PRC and its Asian neighbors to work together to improve systems of production.

Fourth, several ways could be encouraged to support food security investments such as loan projects, technical assistance, demonstrations, and enterprise overseas development.

Finally, with the cooperation and support of various stakeholders, there are some priorities that should be of concern such as the exchange of technology and science in the Asia and Pacific region, land investments, animal and plant disease prevention and control, agricultural disaster prevention and reduction, capacity building in food security management, clean energy development and efficient utilization of agricultural wastes, agricultural machinery development and extension, sustainable natural resources management, and grain reserve management.

By following an open strategy of mutual benefits and win–win outcomes, the PRC is ready to partner with Asian and Pacific governments, international development agencies, and the private sector to achieve the goal of regional food security. The PRC will cooperate actively, share experiences, develop scientific methods, facilitate the construction of the Country Partnership Framework for Food Security in the Asia and Pacific region, promote food production, and guarantee sustainable food security.

India

Exploring out-of-the-box options to feed the poor

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In one of the world's most populous countries, the scale of issues relating to food security is very high—and so are the levels of public programs aimed at addressing them.

With a population approaching 1.2 billion in 2010, India is likely to be the most populous country on this planet by 2030 with 1.6 billion people. It currently accounts for more than 17% of the global population and 456 million poor, or 41.6% living on less than $1.25 a day (Chen and Ravallion 2008). Ensuring food and nutrition security is thus a challenge for India.

Food security concerns can be traced back to the experience of the Bengal Famine in 1943. With the launching of major reforms in 1991, although liberalization was already under way since the 1980s, India has grown out of a period of acute shortages and heavy dependence on food aid to self-sufficiency, or broadly, self-reliance in food. The agriculture sector in India has had quite a revolutionary past with the Green Revolution in the late 1960s and 1970s, the White Revolution (Operation Flood) in the 1970s and 1980s, and efforts to usher in a second Green Revolution to reenergize the food grain sector.

India's agriculture system is also undergoing a structural transformation, especially the high-value segment. Production patterns are diversifying toward high-value commodities such as fruits and vegetables, milk, eggs, poultry, and fish in response to changing demand patterns fuelled by a growing economy and rising income levels. While the achievements of Indian agriculture for at least three decades since the early 1970s, together with a robust economy and buoyant external sector, have helped to ensure macro level food security to a considerable extent, large sections of the population continue to live in poverty and hunger.

The key question is, can India feed itself in the near and medium-term future? Can it enhance agricultural productivity in an environmentally sustainable manner, exploit the untapped potential of eastern India, and play the world agricultural markets to satiate domestic demand? Raising productivity of staples like rice and wheat is a challenge, as the area under these grains is likely to remain constant or even decline due to increasing pressure on land for nonagricultural uses. Unlike in the past, when the country suffered foreign exchange constraints and depended heavily on food aid, India today is in a much better position to enter the global markets, with $283.5 billion in foreign exchange reserves (as of 15 October 2010).

While increased investments and technological breakthroughs can improve availability, these may not necessarily translate into increased accessibility and absorption of food. With nearly 43.5% of children under the age of 5 being underweight (the highest in the world), and 50% of pregnant women being anemic (comparable to African countries), the nutritional security of children and women is a serious issue that needs to be addressed urgently (World Bank 2009).

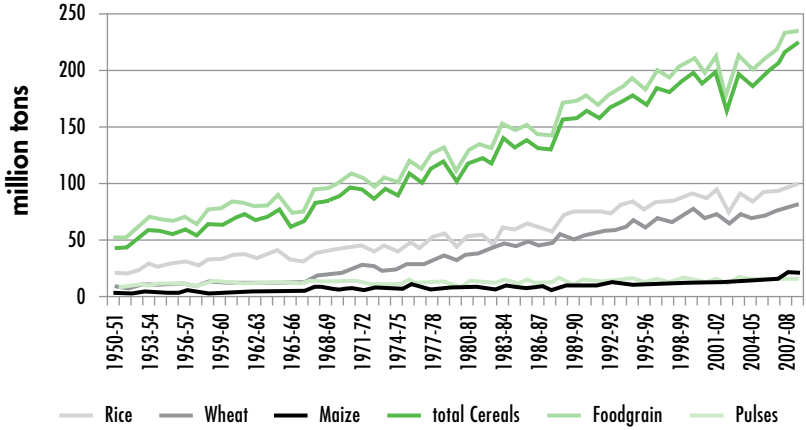
Food and nutrition security is broadly characterized by three pillars: availability, accessibility, and absorption (nutritional outcomes). In an effort to attain these, it is almost certain that it will be necessary to innovate and think about out-of-the-box policy options. The role of various stakeholders and partnerships among them will be critical. These include both the public and private sectors, community groups, multilateral agencies, philanthropic foundations, as well as bilateral collaboration between nations.

Availability of food (physical access)

The policy goal to attain self-sufficiency in food grains in a sustainable manner resulted in a major effort led by the national government in partnership with domestic entities and international agencies to mobilize technical, administrative, and financial resources to launch the Green Revolution. While all-India production of wheat grew at 3.8% in the triennium (3 years) ending (TE) in 1959–1960, it registered a growth of 10.3% in TE 1969–1970. The trends observed in Haryana (from –1.1% to 27.2%) and Punjab (from 3.8% to 25.1%) were spectacular. Between 1950 and 2009, production of food grains and their categories (rice, wheat, coarse cereals, and pulses) increased, but the growth patterns have been volatile (Figure 1). Food grains comprised nearly 64% of the gross cropped area and

accounted for less than 25% of the total output value of agriculture (which in India is defined as crops, livestock, and fisheries) in TE 2007–2008. Yet cereals (probably for food security reasons) continue to dominate the policy debate in agriculture. The high-value segment accounted for 48.4% of the value of agricultural output in TE 2008–2009 and is likely to drive future growth in agriculture.

Figure 1: Production of food grain crops in India: From 1950-51 to 2008-09

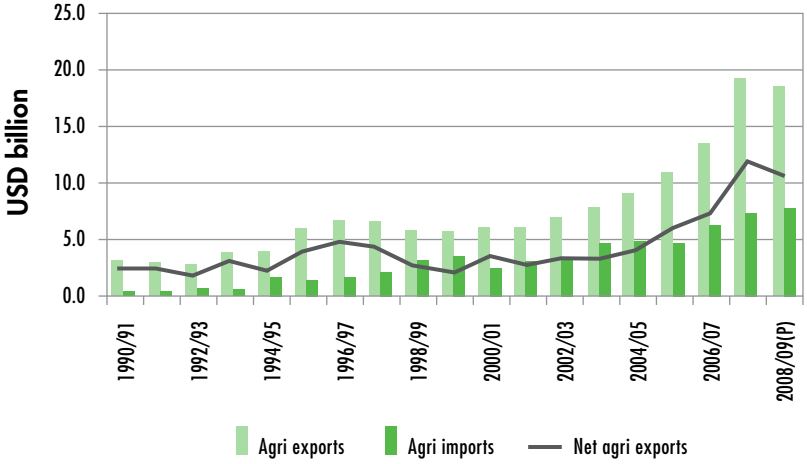


Source: Agricultural Statistics at a Glance 2009, MoA, GoI 2009.

India has emerged as the largest producer of milk (108.5 million tons in 2008–2009) and the second largest producer of fruits and vegetables (197.6 million tons in 2008–2009). Production of fish has also nearly doubled since 1990–1991. Agricultural trade in India has been growing steadily, especially during 1990–2009. Net agricultural exports increased from $2.7 billion in 1990–1991 to $10.7 billion in 2008–2009 (Figures 2 and 3). Between 2001–2002 and 2008–2009, India exported a cumulative total of 33.2 million tons of rice. Despite volatility in production patterns, there have been times when India accumulated large stocks of rice and wheat. As of 30 April 2010, the central pool had nearly 60 million tons of rice and wheat.

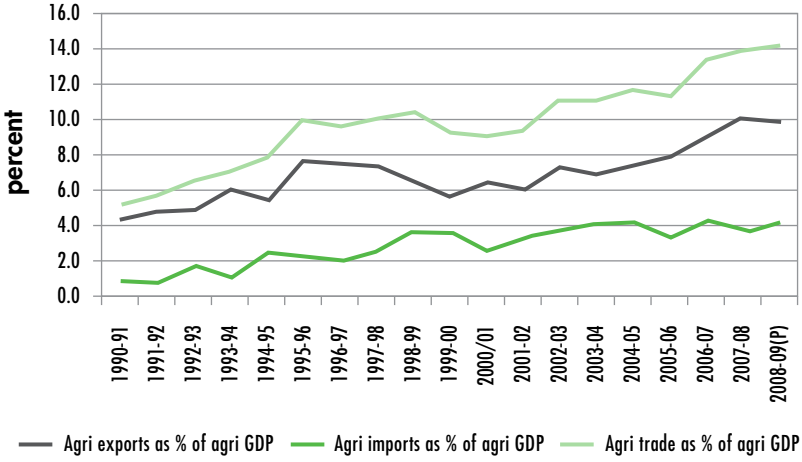
One of the issues pertaining to the ongoing debate on food security is the per capita availability of food. The overall trend in per capita availability of food grains, though fluctuating, has been marginally negative, with per capita availability gradually decreasing. It should be noted that, while availability is a concern, changing demand patterns, especially diversification toward high-value commodities, have to be taken into account. The issue of food security is not so much about *availability* of food grains but more the *composition* of the overall food basket as observed in changing consumption patterns. As economic growth picks up, it is common to observe a change in dietary patterns wherein people substitute cereals with high-value food.

Figure 2: Rising agricultural trade in India



Source: Agricultural Statistics at a Glance, various issues, Ministry of Agriculture.

Figure 3: Agricultural trade as a proportion of agricultural gross domestic product (GDP) 1990–1991 to 2008–2009 (projected)



Source: Agricultural Statistics at a Glance, various issues, Ministry of Agriculture.

Given the present policy imperative of seeking self-sufficiency in food production, as revealed in the 5-year plans, India will have to largely feed itself. The challenge, therefore, is to do it in an environmentally and financially sustainable manner. Issues related to the impact of climate change on agricultural production systems and shrinking water reserves need to be addressed. The government's

flagship programs such as the National Agriculture Development Program (Rashtriya Krishi Vikash Yojana or RKVY) and National Food Security Mission (NFSM), and programs related to irrigation like the Accelerated Irrigation Benefit Program, Integrated Watershed Management Program, and Micro Irrigation Mission, are geared toward providing the much-needed boost to enhance agricultural productivity and, thereby, to promote higher agricultural growth. As for the high-value sector, the National Horticulture Mission is an initiative by the public sector.

The private sector has a greater role to play in terms of investments in value chains and strengthening the firm–farm linkages critical for scaling up processing and retailing operations. The issue of huge postharvest losses (nearly 20%–30% in the case of fruits and vegetables) and poor processing levels arising from fragmented value chains will require large investments and knowledge partnerships. Several private players, both domestic and multinationals, are venturing into agriculture and developing models of better firm–farm linkages. The private sector has already emerged as a significant player in the seed market, and there is opportunity for its greater presence in other input services related to high-value agriculture.

Accessibility (economic access)

Alongside the rising middle class in India, steering the changes in consumption patterns and driving up demand for quality food, there is a large section of the population dwelling below the poverty line. Although the proportion of poor people came down from 55% in 1973–1974 to 27.5% in 2004–2005, the rate of decline has somewhat slowed in the postreform period, and more than 300 million people continue to live in poverty.

Food accounts for more than 50% of the average monthly per capita expenditure in India and even more for low-income groups. Hence, economic access to food is an issue for the poor and vulnerable groups. However, a dietary transformation is under way, with the consumption of cereals declining and that of high-value food increasing. Consumption of cereals has declined over time: per capita monthly consumption of cereals came down from nearly 15 kilograms (kg) in 1983 to 12 kg in 2004–2005 in rural areas, while it declined in urban areas from 11.3 kg to almost 10 kg during the same period (Government of India 2010). This change in consumption pattern is observed across income classes in both rural and urban areas (Kumar, Mruthyunjaya, and Dey 2007).

Growth alone may not be able to ensure food security of the poor and vulnerable. Social safety net programs and employment-generating programs will play an important role in improving accessibility of food to the poor and vulnerable.

The Public Distribution System (PDS) is the largest public sector-managed network for distribution of essential commodities, primarily rice, wheat, sugar, and kerosene. The functioning of the PDS is a joint responsibility of both the

central and state governments. The PDS imposes an enormous financial burden on the public exchequer, which is quite visible from the rising food subsidy bill (Rs555.8 billion in 2010–2011). The efficacy of the system in terms of targeting and coverage varies from state to state and is often questioned. One of the most critical questions is targeting and identifying the poor. Innovations such as social audits for identification of the poor, food coupons to reach out to the beneficiaries, or even direct cash transfers are being discussed and experimented on in some cases.

The National Rural Employment Guarantee Act (NREGA) of 2005 aims at improving the livelihood security of rural households by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to undertake unskilled manual work. The Mahatma Gandhi National Rural Employment Guarantee Scheme has helped create rural job opportunities, which has an impact on the supply of agricultural laborers. The latest effort made by the national government to promote food security is through a national food security bill. The government proposes to ensure that every family below the poverty line in the country will be entitled to 25 kg (or 35 kg) of wheat or rice per month at Rs3 per kg.

Absorption (nutritional outcomes)

An interrelated and important aspect yet to be effectively addressed is nutritional security. Despite intervention through several food-based social safety net programs, some of them running over decades, malnutrition levels continue to be severe and persistent. There is an urgent need for an integrated nutrition and health program for all vulnerable groups, focusing on the role of gender and governance. The extent of India's malnutrition problem can be observed in Table 1. India ranks the lowest in terms of prevalence of underweight children under 5. Although the under-5 mortality rate improved, from 11.5% in 1990 to 7.6% in 2006, the pace of reduction has not been very impressive.

Table 1: Indicators of malnutrition in South Asia

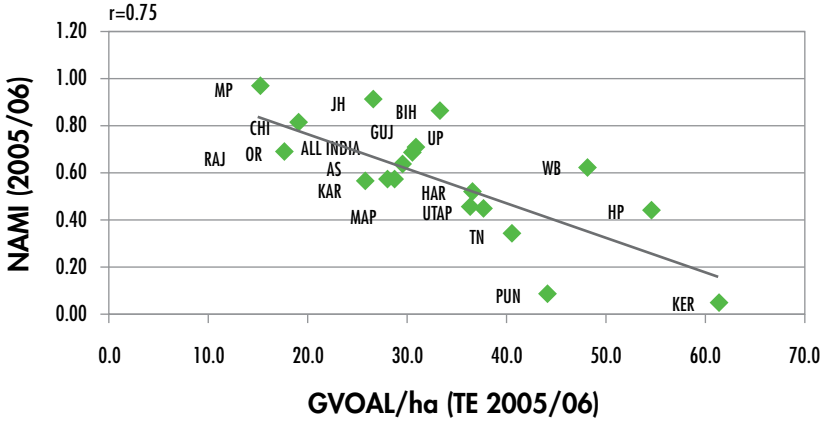
Country	Proportion of undernourished in the population (%)		Prevalence of underweight in children under 5 years (%)	Under-5 mortality rate (%)	
	1990–1992	2002–2004	2000–2006	1990	2006
Bangladesh	35.0	30.0	39.2	14.9	6.9
India	**25.0**	**20.0**	**43.5**	**11.5**	**7.6**
Nepal	20.0	17.0	38.8	14.2	5.9
Pakistan	24.0	24.0	31.3	13	9.7
Sri Lanka	28.0	22.0	22.8	3.2	1.3
South Asia	26.0	21.0	41.0	12.3	8.3

Source: World Bank 2009.

Poor nutritional outcomes of infants and children arise from poor health status of women, overall poverty and lack of hygiene, and inadequate health facilities. In particular, women's access to clean drinking water, toilet facilities, and clean cooking fuel influences their health outcomes, which are critical for child health and nutrition. Over 53% of women do not have access to toilet facilities, 55% do not have drinking water in their premises, and only 29% have access to clean fuel. In India, 35.6% of women suffer from chronic energy deficiency, indicated by a body mass index below 18.5 (Jose and Navaneetham 2010). Micronutrient deficiencies alone may cost India $2.5 billion annually (World Bank 2010).

What is the relation between agricultural performance and nutritional outcomes? Gulati and Shreedhar (2010) observed a negative correlation between gross value of agricultural output per hectare (GVOAL/ha) and malnutrition status (measured as a normalized average nutrition index [NAMI] of –0.75) across Indian states (Figure 4). The higher the level of agricultural output on a per hectare basis, the lower the malnutrition index in the country. Kerala and Punjab, for example, have two of the highest levels of GVOAL/ha in the country, and their malnutrition rates are the lowest. On the other hand, Madhya Pradesh is at the other extreme, with lowest GVOAL/ha and highest malnutrition.

Figure 4: **Value of agricultural output per hectare and malnutrition status across Indian states, triennium ending 2005–2006**



Source: Gulati and Shreedhar 2010.

The Integrated Child Development Scheme and Mid Day Meal Scheme are two flagship public programs directed toward addressing nutritional outcomes for women and children. There are other food-based programs targeted to ensure the nutritional security of vulnerable groups.

Opportunities for linkages and synergy for investment partnerships

Recognizing the importance of augmenting food production and improving economic access to food for better nutritional outcomes, the Indian government has stepped up agricultural investments through the RKVY, NFSM, and other initiatives; introduced major programs like NREGA; and is thinking of introducing a food security bill. It also carries a large subsidy account together with the planned expenditures. The central plan outlay of the agriculture department for 2010–2011 stands at Rs118.8 billion or approximately $2.5 billion, plus additional central assistance in the form of the RKVY of Rs67.22 billion or approximately $1.4 billion for 2010–2011.The Indian Council for Agricultural Research outlay is Rs23 billion or approximately $480 million (planned) and Rs15 billion or approximately $312.8 million (nonplanned). Planned expenditures comprise grants requested by various ministries and hence a large part of the total expenditure budget of the government. Nonplanned expenditures include interest payments, subsidies (mainly on food and fertilizers), loans, etc.

Apart from this, the outlay for the Accelerated Irrigation Benefit Program for 2010–2011 stands at Rs115 billion or about $2.4 billion. The state governments have also stepped up their expenditure share, being Rs180 billion or $3.7 billion in 2009–2010.

In this effort, the role of private sector participation and investment opportunities is also recognized. There is scope for creating synergies with civil society organizations and with multilateral, bilateral, and philanthropic organizations. It is well understood that the scale of the issues related to food and nutrition security in a country like India is quite high and so are the levels of public programs aimed at addressing them. If investments have to increase manifold, they cannot be brought in by the public sector alone; there is need for partnerships. It is likely that a large part of investments will come from the private sector out of their business plans and strategies. While the public sector can incentivize private investments by creating an enabling policy environment, multilateral and bilateral agencies can bring in innovative models of better monitoring and management that can improve the delivery of output per unit of money invested.

If India were to bring down poverty to less than 5% in a decade, what types of investments would be needed to achieve this target, and how much would it cost? Would it be enough to boost investments by 25%, and could that ensure 4% agricultural growth? Or would it need almost a 100% increase in investments related to agriculture to accelerate the growth of agriculture to 6% or 7%. And would such investments be widespread geographically and socially, to ensure food and nutritional security for India's masses? If so, where are these investments going to come from?

Looking into the role of the various stakeholders, the public sector can enhance investments by rationalizing subsidies, as these have much lower rates of return than investments in, say, agricultural research and development, rural

roads, and irrigation. The private sector can take an obvious lead in investments in value chains, be it by farmers or corporate players. The role of the multilateral and bilateral agencies can be to support many of the public sector initiatives as well as private ventures through better technology, innovative models of program management, and knowledge partnerships.

Given India's size and the magnitude and diversity of its challenges, there is space for multilateral agencies, the private sector, and civil society organizations to play meaningful and effective roles.

References

Chen, S., and M. Ravallion. 2008. *The Developing World Is Poorer Than We Thought, But No Less Successful in the Fight against Poverty.* Policy Research Working Paper 4703, August 2008. Washington, DC: The World Bank Group.

Government of India. 2010. Household Consumer Expenditure in India, 2007–08. NSS 64th Round, July 2007–June 2008. Ministry of Statistics and Program Implementation, March 2010. New Delhi.

Gulati, A., and G. Shreedhar. 2010. Agriculture, Poverty and Malnutrition: Linkages and Synergies. Unpublished draft paper. International Food Policy Research Institute, New Delhi.

Jose, S., and K. Navaneetham. 2010. Social Infrastructure and Women's Undernutrition. *Economic & Political Weekly* 45 (13) (27 March–2 April): 83–89.

Kumar, P., Mruthyunjaya, and M. M. Dey. 2007. Long-term Changes in Indian Food Basket and Nutrition. *Economic & Political Weekly* (1 September): 3567–3572.

World Bank. 2009. *World Development Indicators.* Washington, DC: The World Bank Group.

Lao People's Democratic Republic

Targeting a viable and resilient agriculture sector

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The Lao People's Democratic Republic forges ahead as it defines development issues and a new strategy that will need continued support for addressing impediments to integrating the country's comparative advantages in agriculture.

The United Nations Millennium Development Goals call for us to eradicate extreme poverty and hunger and ensure environmental stability. Two of the most recent challenges to achieving these goals are related to food security and climate change. In the Lao People's Democratic Republic (Lao PDR), the agriculture, natural resources, and rural sectors play a crucial role in general economic development, particularly in the government targets on food production and poverty reduction.

In general, the Lao agriculture sector has been recording steady and continuous growth since 2000. This is a commendable achievement, considering that most Association of Southeast Asian Nations (ASEAN) countries have been affected by natural disasters. In the Lao PDR, there has been considerable damage to several irrigation schemes and to crops in a relatively large area, accounting for a loss of about 10% of total production. Nevertheless, agricultural and fisheries production remain overall satisfactory. We estimate that rice production reached 3.3 million metric tons in 2010 and met the target set for the Sixth Five-Year Plan, 2006–2010. It is important to note that we have continued to maintain self-sufficiency in rice, with a surplus of around 300,000–400,000 metric tons for border trade.

The achievements in the Lao agriculture sector were due largely to the benefits derived from significant and continued investments made in the past in expanding agricultural infrastructure and providing strong government support to developing grassroots extension systems. These systems were directly responsible for raising productivity, especially in terms of provision of inputs such as seeds, fertilizers, small credit, new farming techniques, and processing systems. Continued policy support was also essential in generating active and collective contributions from other

economic and social sectors to assist in the development and commercialization of the agriculture sector.

Being part of ASEAN and the ongoing dynamic regional economic integration, especially in terms of transboundary contract farming arrangements, has created very favorable conditions in the last decade for developing our country's agricultural economy. The increased demand in the region for some key agricultural produce has been a catalyst in significantly boosting Lao agricultural production, especially in the case of rice and other food crops, cash crops, rubber, and a few energy crops such as jatropha and cassava.

ASEAN and partner countries have agreed together to build up cooperation in agriculture, fisheries, and forestry, particularly for reducing poverty and strengthening food security and human development. ASEAN has reiterated its continued collective support in the implementation of the ASEAN Charter, especially in our country's contribution to building a new ASEAN Economic Community and implementing the Initiative for ASEAN Integration. We are thankful to our more advanced ASEAN partners and also to the ASEAN+3 partners—People's Republic of China, Japan, and Republic of Korea—for their very important role in providing technical assistance to narrow development gaps between the less and more advanced countries and to help accelerate the harmonization and integration of agricultural development within the region, in parallel with ensuring sustainable development of our natural resources.

We also recognize the necessity for conserving the natural environment and preserving the social and cultural traditions of rural communities while promoting sustainable development in the agriculture, forestry, and fishery sectors. ASEAN has provided significant assistance to the Lao PDR, particularly in building human resources in different disciplines in the agriculture sector and establishing a regional information hub in the Greater Mekong Subregion (GMS).

ASEAN has also been successful in elaborating a new and more responsive action plan that considers the real needs of member countries. The principle of this Cooperation Strategy Framework is to provide a fundamental and improved framework for better cooperation, collaboration, mutual learning, and exchange of successful techniques and technology in agroforestry development among the ASEAN and ASEAN+3 member countries.

Development issues for cooperation

Allow me to raise a few development issues that need continued support and further collective efforts at addressing existing impediments to integrating and synergizing our comparative advantages in the agriculture sector. These issues underlie the main themes for deepening our cooperation in the future:

New cross-border links. The Lao PDR needs to be proactive in addressing socioeconomic problems resulting from increased interconnectivity with the opening of borders and the freer flow of goods, services, and people. Opportunities

in the cross-border transport corridors provide us with an important link to expand our agricultural output and trade. The Lao PDR has been focusing on the health and education sectors to create a skilled and efficient workforce that will be able to support a competitive cross-border agriculture sector. Subregional cooperation in agriculture will help the Lao PDR to directly expand into new crops for markets outside the border. Our government is keen to explore new policies and to provide necessary incentives for commercializing agriculture and participating in agricultural value chains. We are fortunate to have ASEAN member countries and ASEAN+3 partners helping us achieve this goal.

Crafting new policies, regulations, and incentives. The current trend in many parts of the world is to move away from traditional agriculture toward labor-intensive manufacturing and high-tech commerce. However, the Lao PDR still has a comparative advantage in benefiting from modernized agriculture due to the presence of cross-border trade and market links and a favorable natural environment. Policies for modernizing agriculture to support increased food supply and income generation alongside export of agricultural products will eliminate the risk of becoming a net food importer. Institutional and structural reforms are needed to participate gainfully from trade liberalization. Otherwise, there will be problems resulting from price instability, overemphasis on exports, and unsustainable practices.

The Lao PDR has traditionally exported only limited quantities of agricultural products, including wood and processed wood products. New policies are needed for supporting shifts to "new" crops and managing potential food security issues. Consideration has to be given to ensuring equitable distribution of benefits from contract farming and pro-poor trade. For example, there is a need to correct the dominance by a few large traders in favor of benefits flowing to the poor through small-scale trade. Strong adherence to policy and regulatory interventions are needed to improve food safety and sanitary and phytosanitary standards.

Developing new crop choices. A shift to high-value food and energy crops for export will stimulate agricultural growth and increased investments, resulting in income gains for farmers and the rural labor force. However, exposure to international price volatility and supply instability will require appropriate information and analysis of market trends to enable informed planning and decisions on crop choices and production targets. Safeguard policies will be needed to counterbalance potential long-run effects of shifting away from domestic food agriculture to cross-border farming of industrial crops.

Strengthening collective efforts to prevent or mitigate new risks. Transboundary animal diseases and crop pests and diseases are major issues in the ASEAN region and especially in GMS countries. The effects of flood and drought, including climate change within and outside the region, are another source of concern for the region's agriculture. Mitigation, management, and control of these risks will need cooperative regional investment in research and development. The Lao PDR is most vulnerable to these risks, and we are hopeful that ASEAN

member and partner countries will provide the support needed to address regional disease control and to build effective sanitary and phytosanitary systems along our borders.

Sustaining technology development to cater to new capacity needs at all levels. In view of new risks, the ASEAN region urgently needs to develop its capacity to deal with transboundary diseases and pests and the potential effects of climate change on crop production and food security. In the Lao PDR, there is a strong need to keep pace with technologies for growing "new crops" and for the ability to respond effectively to agricultural emergencies, e.g., transboundary diseases and food safety standards.

Appropriate policies and instruments to bolster new ways of effective engagement with smallholders. The new opportunities in agriculture in nontraditional crops such as biofuels may favor large producers and traders. Smallholders and rural workers will require assistance to participate gainfully in and benefit from the new opportunities in agriculture. As far as the Lao PDR is concerned, we have enjoyed very productive assistance in the development and extension of biogas and biomass technologies in the rural areas. These schemes have been instrumental in helping achieve food security, generating rural energy for the poor, and ensuring a more environment-friendly type of agriculture.

Thus, we have set for ourselves the challenge to improve investments in both the agriculture sector as well as farmers. Investing in farmers means more than connecting them to markets; it means making sure they have secure land tenure, fair contracts, and access to information, and improving their access to health, education, and extension services. Strategic thinking is needed to identify measures to restructure the rural economy, link farmers to markets, strengthen farmer organizations and rural institutions, address new challenges such as climate change, and build the institutional capacity of the Ministry of Agriculture and Forestry (MAF).

One of the major goals MAF has set for itself is in relation to food security. MAF is currently updating its strategy and sees the following challenges to food security:

- First, we need to look at ways to make agriculture resilient so that it is adapted to climate change and fluctuating markets. This means there must be sufficient quantities of food for a nutritious and healthy national diet, proper utilization of food for nutritional well-being, and access to food at all times.
- Second, we need to focus on (1) diversified agriculture that meets nutritional and economic standards; (2) mixed farming systems; (3) minimizing risks of natural disasters, price volatility, and market failures; and (4) monoculture plantations.
- Finally, we would like to promote "smart agriculture" that strikes a balance between food security and market orientation.

The economic crisis should encourage all of us to look for ways to improve resilience; reduce vulnerability; and develop the adaptive capacity of governments, development workers, and farmers to adjust to the fast-changing movements that are taking place due to increasing engagement with the private sector and regional markets as well as climate change.

Highlights of new 10-year MAF strategy

In recent years and especially in the last decade, agriculture has experienced tremendous changes, and it has significantly contributed to national growth. Difficult areas still persist, but we are very encouraged by the progress achieved to date. In the Lao PDR, agriculture is increasingly synonymous with growth, innovation, research, competitiveness, private sector development, and regional integration. It is with this in mind that MAF has prepared a new 10-year strategy for 2010 to 2020 and a Master Plan with an Investment Plan up to 2015 that aligns with the Seventh Five-Year Plan.

This work is a collective endeavor, the fruit of wide-ranging consultations across levels and sectors involving local governments, farmers, and the private sector. The contributions of the Agriculture and Natural Resources Sector Working Group have been instrumental in firming up the strategy. The strategy is of a cross-sectoral nature, since it integrates many key documents such as the national nutrition strategy and the national climate change action plan. Let me present to you some important aspects of our new strategy.

The first goal is to guarantee food security. This is still indeed a priority, as 23% of our people are malnourished and 37% of children less than 5 years old are below normal weight. Food security is a challenging goal. If we want to achieve this, we need to reverse the current trend of declining public investment in the agriculture sector and work together with concerned agencies. But we also have to add the food safety dimension to successfully manage accession to organizations such as the World Trade Organization. We must achieve considerable progress in this regard. Activities such as controlling pesticide residues or enhancing product traceability must become routine. Capacity development is particularly needed in this field.

Our second goal is to facilitate the adoption of sustainable practices by farmers. Our country has the comparative advantage of having considerable natural capital: forests, rivers, arable lands, and biodiversity, with an enormous pool of indigenous varieties. MAF will continue proposing sustainable techniques to producers and applying careful land use planning, in close cooperation with the National Land Management Authority.

It is also imperative that the forestry sector must better its performance. MAF has recently created a Department of Forestry Inspection, which will be considerably reinforced under the next 5-year plan to allow stricter control over the forestry sector and to ensure sustainable use. Agricultural concessions and contract

farming will also need closer monitoring. We will thus continue to set incentives and proactive policies at several levels. This will follow a three-tier approach:

- First, we will pursue effective decentralization at the *kum ban pattana* (village development cluster) level. Our services will not only include traditional technical extension packages but will also aim to facilitate the development of farmers' organizational skills and interactions with research, agribusiness, and other agricultural service providers. The services will also help broker links with market actors and provide information about rural financial support opportunities. To provide support especially for rural remote areas, this will require substantial public investments from our government and development partners, but most resources are to come from private sector businesses to help build robust and viable rural commodity value chains.
- Second, we must continue to provide a favorable investment climate to investors who will be respectful of the environment.
- Third, incentive tools will be tested in the next 5 years for environmental purposes. MAF will prioritize efforts to prepare the country, its farmers, and entrepreneurs to fully benefit from these new instruments. The Lao PDR ranks second globally in terms of the number of rice varieties. Our natural capital, including agrobiodiversity, offers tremendous opportunities and provides real comparative advantage for our agriculture and economy. Producing and exporting typical Lao organic products, and certifying and protecting our varieties and techniques are trends we need to encourage.

Our third goal is to manage successfully the ongoing transition toward a commercial and exporting agriculture. In this regard, the major emphasis will be on the following:

- First, the access of our farmers to agricultural credit must be improved. Massive investments are also essential for local agriculture-related infrastructure such as markets, storage and processing facilities, control laboratories, and slaughterhouses. Through public–private partnerships, we will leverage valuable private resources, expertise, and marketing channels. Development partners can also assist by promoting quality foreign direct investment from their private sectors.
- The second level of intervention consists of helping producers and other agriculture stakeholders to get better organized. The recently enacted decree on associations and cooperatives is very important for our farmers, and MAF has elaborated a specific strategy to develop producers' organizations. The more the producers will be linked and organized, the stronger the country will be in entering regional and global value chains. We have already reached very positive results on this matter with the association of coffee producer groups in the Boloven Plateau. We will also vigorously support innovative and profitable marketing options such as fair trade; organic production; the use of brands, labels, and geographical indications; and various forms of contract farming.

But we will not be able to modernize our agriculture without modernizing our institutions and ministry. Thus, an essential pillar of our strategy will be to reinforce the capacities of MAF and concerned institutions, both the present and new ones. We still need a strong ministry, but successfully repositioned on new roles, supplementing roles played by the private sector. Involving the private sector and civil society organizations will be instrumental to building a viable and resilient rural economy.

It was due to the multifunctionality of our agriculture systems and the cross-border value chains that our rural economy has maintained its productivity and viability. It is important that MAF understand the dynamics of regional economic integration and from here develop needed institutions to support our gradual integration into the region's vibrant economy. MAF thus will be less a direct actor in the provision of agricultural services and more engaged in a regulatory role. Agricultural research and extension and skilled human resources development will be reinforced, particularly in partnership with the private sector.

In terms of aid management capacities, within the framework of the Agriculture and Natural Resources Sector Working Group, we have worked tirelessly on important subjects such as reducing the number of project implementation units, and monitoring and evaluation, and we have agreed to set up a program management division. We have prepared as well the agriculture sector strategy, shared and discussed several subsector strategies, and formulated the first program-based approach for rural development in the Lao uplands.

Our government has rightly set a very ambitious objective of economic growth for the next 5 years, and I strongly believe that, with adequate investments, the continued support of our development partners, and the increased engagement of the private sector, agriculture and forestry can play a decisive contribution to achieving the gross domestic product and national targets that also address the Millennium Development Goals.

Pacific Subregion

Building healthy islands through partnership

Joketani Cokanasiga
Minister for Agriculture and Primary Industries, Fiji

Hans Joachim Keil
Associate Minister for Commerce, Industry, and Labor, Samoa

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Consultant, Food and Agriculture Organization

Pacific island countries join hands with FAO and other development partners to harmonize efforts toward achieving food security and sustainable livelihood for the poor and vulnerable.

Traditionally, the Pacific island countries (PICs) achieved food security through sustainable agricultural and fishing practices and a reliance on local staples such as roots and tubers, bananas, and breadfruit. However, common constraints impede their efforts to achieve sustainable food security at both the national and household levels.[1]

Imports of cheap, low-quality (e.g., lamb flaps, turkey tails), and convenience foods compete with domestic foods (e.g., root crops) that often have higher production costs and are less convenient to store and prepare. The increasing reliance on food imports is of special concern in Polynesian and Micronesian countries with limited agricultural production and export earnings.

Energy costs and reliability, and lack of infrastructure that would support the production and local trade of traditional food, are barriers to the consumption of local foods. Inefficient transport systems are unable to ensure safe storage of food in transit, especially to rural areas and outlying islands. The Pacific is a maritime region: 98% is ocean. Without reliable and affordable transport systems, food security will not be achieved.

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[1] The introductory section of this paper was added to provide background to the subsequent discussion on the Food Security and Sustainable Livelihood Programme. The entire section is sourced from the booklet *Towards a Food Secure Pacific: Framework for Action on Food Security in the Pacific* (2010).—Ed.

Urbanization and high population growth rates (in excess of 2% in Melanesian countries), accompanied by stagnant agricultural productivity, are severely challenging existing farming systems to produce enough food to meet the needs of growing populations.

Environmental shocks also impact food security. With climate change, the maximum speed of tropical cyclones is expected to increase by up to 20%.

Controlling the safety of imported food is particularly an enormous challenge for the Pacific. Inadequate food safety laws, regulations, and standards, and poor capacity to enforce them, have resulted in the importation of low-quality food products that are also high in fat, sugar, and salt and that pose serious health risks to consumers. People living in the Pacific have some of the highest rates of obesity in the world, 40% or higher in many countries.

Less noticeable but equally of concern are vitamin and mineral deficiencies arising from heavy consumption of poor quality food and very low consumption of fruits and vegetables. Iron-deficiency anemia is reported to be 20% or greater in children and pregnant women in 15 of 16 PICs surveyed.

The Pacific cannot afford the health consequences of a lack of food security. Acute care for noncommunicable diseases is very expensive, and the economic impact of early death and disability before age 65 is staggering. Also, by compromising the health and nutritional status of Pacific people, a lack of food security reduces productivity and drains government resources. Ultimately, the lack of food security contributes to the Pacific's burden of poverty and retards national development.

Providing a comprehensive approach to food security

The Food Security and Sustainable Livelihood Programme (FSSLP) is a comprehensive program aimed at improving the food security and livelihoods of poor and vulnerable households, and especially women and youth, in the Pacific. The FSSLP draws on key lessons learned by its predecessor, the Regional Programmes for Food Security (RPFS), which were implemented based on decisions and guidance by the Food and Agriculture Organization (FAO) South West Pacific Ministers of Agriculture at their biannual meetings.

The FSSLP program design went through several stages. An initial preparation mission for RPFS expansion took place between February and May 2007. The mission visited the three subregions of Melanesia, Polynesia, and Micronesia; consulted with national stakeholders; compiled country profiles

Scope of the Food Security and Sustainable Livelihood Programme for the Pacific (14 countries)

Cook Islands, Fiji, Kiribati, Marshall Islands, Federated States of Micronesia,Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu

and project concepts; and drafted an RPFS expansion phase document. This document was approved in principle by the seventh meeting of agriculture ministers in Majuro in May 2007.

In early 2008, FAO and the International Fund for Agricultural Development (IFAD) led a joint programming support mission, which explored possible partnerships and examined a range of program design and management issues for the FSSLP. An updated FSSLP brief was prepared, reaffirming the importance of adopting a programmatic framework and building partnerships within the region; areas for possible refinement of the FSSLP were also identified. Concurrently during the first quarter of 2008, the FAO subregional office for the Pacific islands carried out a comprehensive mapping of all externally supported interventions in agriculture and rural development in the PICs (FAO 2008).

An independent evaluation of the RPFS in July–September 2008 brought out the importance of a program design that could respond to changing conditions and priorities, achieve cost economies, and help strengthen national planning, design, and management capacities. It also highlighted the need for attention to project selection criteria, people-centered targeting, gender orientation, and participatory approaches to planning and monitoring processes. All these lessons learned were incorporated in the design of the FSSLP.

A stakeholders' consultative workshop on strengthening partnerships in food security and sustainable partnerships in the PICs was convened in September 2008, wherein participants from the PICs, nongovernment organizations (NGOs), and the aid community validated that investment in food security and sustainable livelihoods remained a very high priority in the region. They also had the opportunity to review the findings of the mapping exercise and the RPFS independent evaluation. Following this, a joint FAO–IFAD final program design mission was undertaken from 14 November to 6 December 2008 in Samoa, Tonga, and Fiji, holding discussions with the FAO subregional office in Apia, government officials, funding agencies, NGOs, staff of the Secretariat of the Pacific Community, and other regional institutions. The present program design report is the result of this mission.

It is anticipated that the FSSLP will provide a harmonized framework for FAO, IFAD, and other development partners' initiatives in food security and sustainable livelihood in the region. It will also form a major part of FAO's national medium-term priority frameworks with each of the Pacific countries.

Goal

The goal of the FSSLP is to contribute to the achievement of food security by poor and vulnerable populations, and especially by women and youth in the covered countries.

Objectives

To achieve this goal, the program will pursue the following objectives, each corresponding to a program component:

- Increased and ecologically sustainable crop, livestock, fisheries, and/or (agro-) forestry production and productivity, as well as other livelihood activities, will be advanced to improve the availability of and access to food in vulnerable and poor households, especially for women and youth. Dietary practices and food safety will be enhanced.
- Improvements in food security will be achieved through better access, especially by remote vulnerable households and women, to sustainable agricultural inputs, services, and markets.
- National and household food security will be improved through strengthened capacities, policies, and strategic actions at the country and regional levels to address immediate and long-term food security challenges.

Program focus

The program focus is based on two main considerations:

- To achieve comprehensive and sustainable improvements in household, national, and regional food security, all four aspects of food security—availability, access, nutrition, and safety and stability—need to be addressed. Within each of these fields, program activities will cover a range of possible investments, determined by local agroecological conditions, market demand, and participatory priority setting.
- Present farming systems in the region are largely applying organic practices, as the use and availability of agrochemicals are limited. The program will therefore promote sustainable and organic improvements in production and productivity. In this manner, the program impact on the fragile environment will be positive or at least will avoid negative effects. This approach will also provide access to high-value organic niche markets, allowing farmers to earn premium prices.

Implementation strategy

Program implementation will be based on the following considerations:

- Meeting the needs of poor and vulnerable populations in a wide range of small and larger countries poses challenges in terms of logistics and delivery costs of relatively small investment projects, if each country were to be supported individually. A regional program approach is therefore required to be able to reduce overhead costs and to gain economies of scale.

- A program approach rather than a project approach will allow for flexibility, adjusting program activities to changes in the implementation environment.
- Food security has regional, national, and local or community dimensions. The program will therefore support initiatives at each of these levels. However, most investment resources will be focused on the community and national levels to ensure impact.
- Because food insecurity, poverty, and vulnerability are interrelated, the program will adopt a targeting approach to ensure that food security initiatives and investment resources are reaching poor and vulnerable households, and especially women and youth.
- To ensure flexibility and provide the opportunity to meet priority demands as they arise, the program will apply a fund approach. Under this, individual, regional, and national project proposals will be developed in line with program targeting and substantive criteria, using a standard outline. This will provide sufficient information to ensure a proper review and approval process. In the development of national and local project proposals, participatory methods will be used, involving women and youth in priority setting, planning, and implementation.
- Individual project proposals can be submitted to the fund by eligible agencies in the public sector, the private sector, NGOs, and community-based organizations (CBOs). Eligibility criteria for these agencies will ensure they have the proper approach, implementation, and management capacity to implement projects according to the program objectives and strategy.
- During the 6-year program, the implementation of local and national projects will be phased to take into account limitations in design and implementation capacities. Individual local and national projects will, on average, be implemented over a 3-year period. Projects will be phased in during the first 4 years. Regional activities will be undertaken throughout the program period.
- The funding approach will entail aid coordination, as program resources will be mobilized from several agencies and applied under a single program approach.

Gender strategy

Gender equity in all program activities will be promoted. For that purpose, a gender advisor will be posted in the program management unit. An essential project design criterion for national and local projects will be the extent to which a project meets priorities expressed by women and the extent to which women are involved in its design, implementation, and evaluation. Where the program will support the acquisition or creation of individual assets, these will be registered in

the name of the woman in case of a woman-headed household, and in the names of both spouses in case of other households.

The program will ensure that women will represent at least 60% of the beneficiaries involved in program initiatives. The interests of women will be properly represented in the respective steering committees. Preference will be given to female candidates in the recruitment of program management staff at the regional, subregional, and national levels, given equal qualifications and experience.

Program structure and intervention logic

The FSSLP will be implemented as a strategic investment program comprising

- two components for country projects,
- one component for supporting multicountry food security initiatives, and
- a fourth component for program management at both the regional and country levels.

Investments will be funded through a multiyear commitment by development partners, with an initial time frame of 6 years, and provision for expansion in the number of development partners and funding over time.

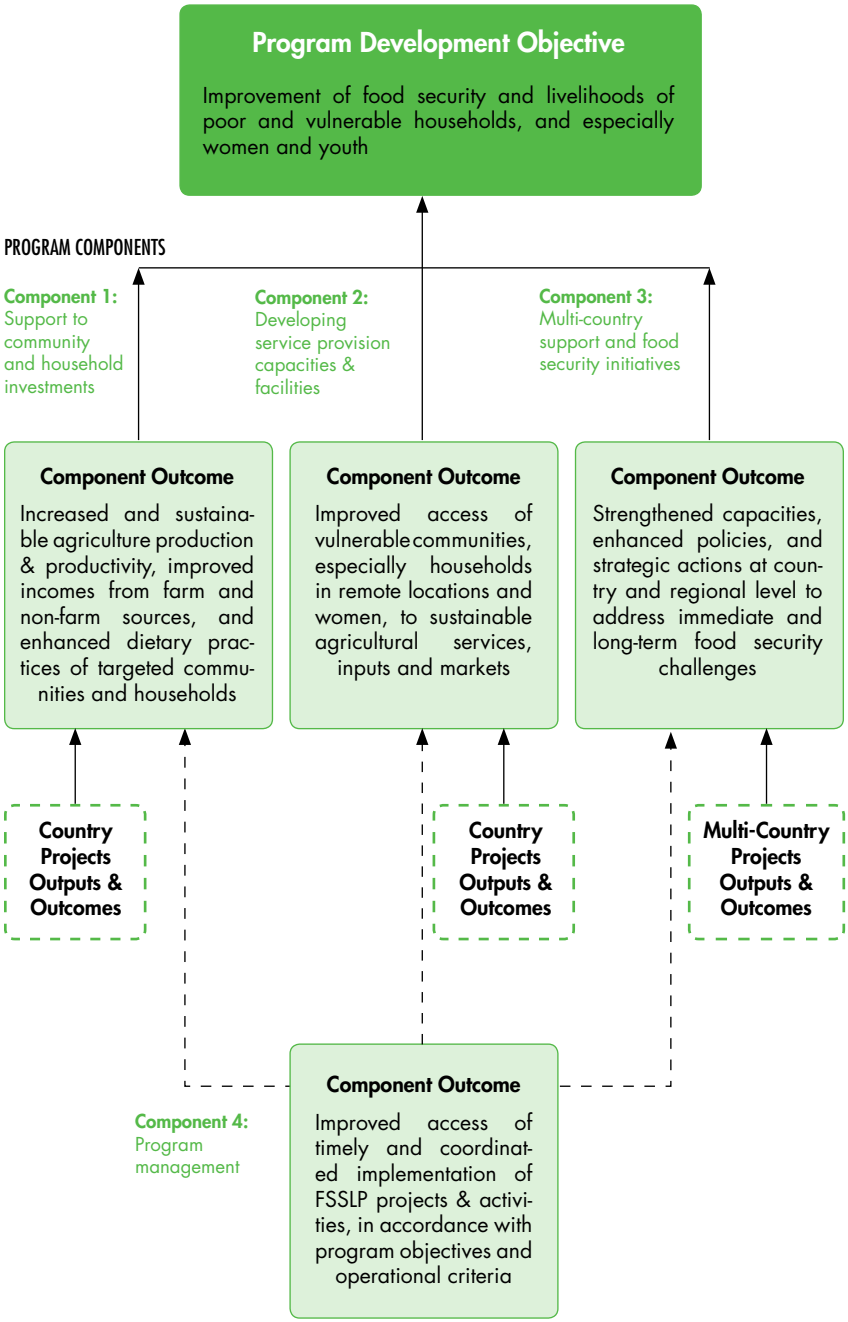
The FSSLP's program development objective is the improvement of food security and livelihoods of poor and vulnerable households, and especially women and youth. It will achieve this by providing resources for the following components, also shown in Figure 1.

Component 1: Support for community and household investments

This component will help communities and households to undertake a range of food security and livelihood activities aimed at increasing agricultural production and productivity and enhancing household incomes, thereby boosting the capacity to buy food, improve diets and nutrition, and build resilience to withstand external shocks to their livelihood systems. Projects that may be supported by this component include crop and livestock development, integration of agroforestry and nontimber products into the livelihood system, small-scale fisheries and aquaculture development, agricultural processing, marketing and value chain development, rehabilitation and sustainable management of natural resources for agricultural production, nonfarm income generation and microenterprises, and activities targeted specifically at human nutritional improvements.

Broad project ideas in such areas have been identified in previous program development work with country proponents. Further detailed design of individual projects will be undertaken to ensure that the program strategy and criteria of targeting and focusing on different aspects of food security will be implemented. Within this program framework, the design will apply a participatory approach with the target group and focus on food security and livelihood issues and priorities determined by them, in particular those of women, youth, and vulnerable households. Thus, each project will target an operationally defined target group.

Figure 1: Pacific Regional Food Security & Sustainable Livelihoods Programme: Intervention Logic



The expected project benefits and impact on the target group will be analyzed, and practical arrangements for monitoring project outputs and systems and behavioral outcomes incorporated in the project design. Project proposals will be developed by eligible agencies in the public, NGO, CBO, and private sectors.

Component 2: Development of service provision capacity and facilities

This component will support countries to strengthen their food security situation by improving access of rural communities, especially those in remote locations, to sustainable agricultural services, inputs, and markets. This will complement the community and household investments supported under Component 1. To ensure that interventions address the food security needs of the poor and vulnerable, special emphasis will be given to targeting mechanisms during detailed design of projects, including a strong gender focus. Assistance may be provided to such country projects as developing or upgrading seed multiplication facilities; fish hatcheries and fishing community centers; improving facilities for agricultural research and food processing; provision of transportation infrastructure, including wharf and boat servicing facilities and farm-to-market roads; and strengthening capacities of development agencies.

Component 3: Multicountry support and food security initiatives

This component will provide support to food security initiatives at the regional and/or subregional levels. The objective is to bolster national initiatives through enhanced capacities, strategies, and policies, as well as to help fill gaps that cannot be covered by individual country projects. In particular, to address the limited capacity of countries in project formulation and review processes, this component will at the outset provide close training and facilitation support to the national project coordinators (NPCs) and project teams within each subregion. This will include hands-on guidance and mentoring and will permit learning on the job. This component has two subcomponents:

Subcomponent 3.1: Subregional training and facilitation support to countries

Three full-time subregional training and facilitation teams will be formed and deployed in each subregion—in Pohnpei (Micronesia), Honiara (Melanesia), and Apia (Polynesia). Each team will be staffed by a professional subregional facilitator and a program assistant. Their primary role will be to train and provide hands-on advice to NPCs and project teams in project design and continuing support during implementation.

In each country, a national food security assessment will be drawn up for the national program steering committee (NPSC) to allow it to make informed decisions on the application of the program strategy in the country, taking into account national and local considerations. In particular, it will provide a basis for the NPSC to determine priority food security sectors and/or subsectors, the

priority program area, and the program target group. This will constitute the basis for the development of individual projects at the household and/or country level to be supported by the program.

Subcomponent 3.2: Support for multicountry food security initiatives

This subcomponent will support multicountry food security initiatives in the following programmatic areas:

- planning, policy, and program development support;
- climate change preparedness, adaptation, and mitigation;
- food quality and safety improvement; and
- facilitation of trade and marketing, and capacity development.

Component 4: Program management

The main objective of this component is to ensure that program resources and activities are managed effectively to achieve timely results in accordance with program objectives and operational criteria and procedures. It will also help facilitate learning and sharing of lessons among stakeholders, including communities, service providers, officials, and international development partners. Emphasis will be given to partnership building, collaboration, and labor sharing, thereby contributing to the coherence of the development effort.

Key processes supported will include coordination with country stakeholders and development partners; appraisal and approval of project proposals for funding; financial management at the country and overall program levels; and instituting a robust system of monitoring, evaluation, review, and learning as part of sound program cycle management. Included will be annual stakeholder review workshops at the country and regional levels to review progress and results and decide on needed actions to improve performance. Midterm and terminal review processes will also be supported.

Funds will be provided for establishing a regional program management unit in Apia or near the FAO subregional office and headed by an internationally recruited full-time regional program manager (RPM). Staffing will include a gender and participation specialist, a planning and monitoring and evaluation (M&E) specialist, an accountant, and a secretary. The RPM will be assisted by a regional development coordinator, based in Suva, to ensure coordination with development partners and regional institutions located there. The component will also fund the setting up of a national program coordination unit in each of the 14 countries. Each unit will be headed by an experienced and full-time national program coordinator and include an accountant. They will oversee project implementation staff in discreet country projects; the costs of the latter have been integrated in the average project cost estimates in Components 1 and 2.

Scope for partnership arrangements

As this is a multiagency-supported and -implemented project, agreements will need to be drawn up at appropriate levels to ensure smooth implementation. Memoranda of understanding will need to be developed primarily for the following:

- between aid agencies and program management, particularly FAO and IFAD, agreeing on the program approaches, systems, and criteria, and how to jointly carry out supervision and to manage possible differences;
- between aid agencies and FAO and/or between aid agencies and individual countries for the financing of program activities;
- between the program and implementing agencies, primarily the ones overseeing regional projects; and
- between program management and regional agencies, including FAO, on practical arrangements such as accommodation and logistics, where facilities are shared.

Work planning, design, and M&E linkages

The program cycle of the FSSLP encompasses yearly processes of (1) planning, detailed design, and approval of national and multicountry projects and activities; (2) implementation, monitoring, and reporting; (3) stakeholder review, evaluation, and lesson learning; and (4) communication and feedback for planning future cycles. In this context, the program monitoring, evaluation, and learning system will play a pivotal role in supporting program planning and quality enhancement processes as well as facilitating accountability and transparency.

Planning processes will involve preparation of annual work plans and budgets (AWPBs) at the country and regional levels. These will incorporate projects, activities, and budgets reviewed and recommended by steering committees at the national level and approved by the regional program steering committee. Their progress and achievements will be subject to monitoring and review over the year, with feedback to current as well as successive AWPBs. The integrated planning, M&E, and learning system of the FSSLP will emphasize participation of key stakeholders in program planning and review, and promote the sharing of information on project results, including success stories and key lessons.

References

2010. *Towards a Food Secure Pacific: Framework for Action on Food Security in the Pacific.* http://www.foodsecurepacific.org/documents/FINAL%20TOWARDS%20A%20FOOD%20SECURE%20PACIFIC_June1.pdf.

Food and Agriculture Organization (FAO) Subregional Office for the Pacific Islands. 2008. Food Security and Sustainable Livelihoods in the Pacific Island Countries: Development Partners Mapping Study, May.

Chapter 4

Fostering food security through regional cooperation and integration

Any discussion of food security in Asia would not be complete without putting on the front burner that staple of Asian diets—rice. In this chapter, which parallels Session 7 of the Investment Forum, organized in collaboration with The Asia Foundation, development economist C. Peter Timmer notes that, despite rapid changes in Asia, rice remains the largest single source of calories for the significant majority. The world community can play a role in ensuring that the rice bowls do not go empty.

The changing role of rice in Asia's food security

C. Peter Timmer[1]

Food security in Asia has traditionally focused on rice, but rapid economic growth in the region and its accompanying structural transformation are redefining the needs of Asian consumers.

The food crisis of 2007–2008 caught most of the countries in Asia unprepared for a sudden spike in food prices, especially the price of rice. The panicked response of both rice-importing and -exporting countries is testimony not only to the continued political importance of rice, but also to how little long-run strategic planning has gone into the formation of rice policy in Asia and its relationship to food security.[2]

The relatively minor impact of the food crisis on the welfare of poor consumers in Asia, as far as the data indicate, suggests that rice might not be as critical to food security as political economists who analyze Asian policy are used to thinking. Part of this result stems directly from the overall success in keeping rice prices stable in most of the large Asian countries, chiefly by using trade policies that had a devastating impact on prices in the world market for rice (Dawe 2010). But part of the lack of impact may result from the fact that rice prices were already high in many Asian countries, and the poor had already been affected. Finally, rice may simply not be as important in the food baskets of most Asian consumers as it used to be.

Food security in Asia has traditionally been defined as having stable prices for rice in the major urban markets of a country. The world market was used as an instrument to defend this goal, with imports and exports controlled by government authorities tasked to defend stable prices (Timmer 1996). That approach to

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2 This paper is a slightly revised version of the paper that was presented at the Investment Forum for Food Security in Asia and the Pacific, 7–9 July 2010, and that was supported by The Asia Foundation. It draws directly on presentations to the ASEAN Food Security Conference 2010 held in Singapore, 16–18 June 2010, and an earlier food security investment forum held in Dhaka, Bangladesh, 25–27 May 2010. Special thanks go to Tom Slayton and Tom Reardon for very helpful comments on an early draft of this paper.

food security made sense when a third of the economy was dependent on rice production, marketing, and consumption, and when well over half of daily caloric intake in some countries came from rice. With a few important exceptions—people in Bangladesh and Viet Nam still get more than half their calories from rice, for example—that world no longer exists. But the mindset still exists, and most discussions about food security in Asia even in 2010 still focus on rice (Timmer 2010a). It is time to update that mindset.

Part of the updating requires a clearer recognition of who consumes rice. Increasingly, rice is consumed by the poor, who usually must buy most of their rice in rural and urban markets. Almost by definition, having a surplus of rice to sell to the market raises a family above the poverty line in most Asian countries. This reality, of course, makes rice more, not less, important to food security in Asia; but it also makes a mockery of the strategy of most Asian countries of keeping rice prices stable by keeping them high, well above long-run levels in world markets.

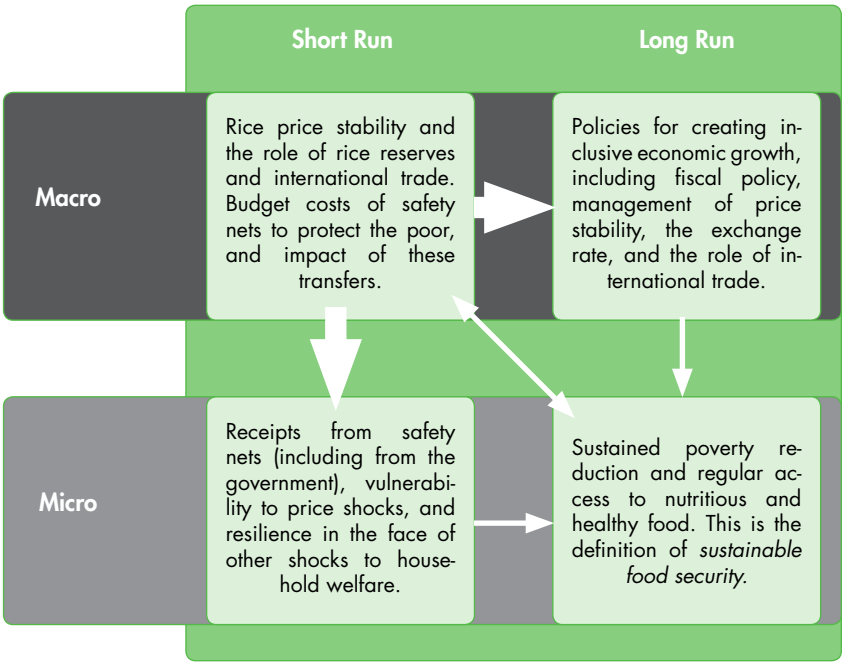
When *food security* is equated with *food self-sufficiency*, this strategy may make sense, because it is easier to stabilize domestic food prices using domestic production—stimulated by high prices—than to follow and depend on the world market for rice, with its great price volatility. But this strategy forces poor consumers to pay high prices for rice, and it increases considerably the degree of poverty in a country. Self-sufficiency in rice is a political strategy, not a poverty strategy. If countries were more open to rice trade, they would be richer, not poorer. The big question is how to make such openness possible when policy-makers and the general public distrust the world rice market, for reasons that are easy to understand (Timmer 2010b).

A framework for understanding food security

Especially when a long-run perspective is needed, it is useful to have an organizing framework for understanding how the essential components of food security relate to each other. In what is otherwise an extremely complicated food system, this framework should be as simple as possible (but no simpler, to quote Albert Einstein). The framework used here divides the world into issues facing policy makers in the short run (e.g., 1–2 years) versus the long run (5–10 years or longer), and at the macro, economy-wide level versus at the household, or individual level (Figure 1).

The policy objective in this simple framework is for all households to have reliable and sustainable access to nutritious and healthy food. Thus, "food security" is achieved by ending up in the bottom right box of the matrix. The starting point, however, is the upper left box, where policy makers deal primarily with macro-level issues in the short run. To the extent they are concerned about the welfare of poor households, in the short run the best they can do is stabilize food prices and send transfer payments—via safety net mechanisms—to those households most affected during a food crisis when prices rise sharply.

Figure 1: Basic framework for understanding food security issues in Asia



In an ideal world, policy makers could use economic mechanisms under their control to shift households directly to the long-run objective, the lower right box where sustainable food security is achieved. In return, policy makers would receive political support for this achievement, hence the two-way diagonal arrow connecting the upper left and lower right boxes. The diagonal arrow reflects a technocratic view of the world, where policy makers take informed actions on behalf of public objectives and are rewarded when they succeed.

In fact, market economies, and politics, do not work that way. Policy makers at the macro level must implement long-run measures to stimulate inclusive, pro-poor economic growth, and to sustain that growth for decades, in order to have a measurable impact on poverty via the small vertical arrow leading from the upper right box to the lower right box. These long-run measures are reflected in the broad arrow from the upper left to the upper right, but it is hard to concentrate the political and financial resources needed to make this arrow an effective mechanism to stimulate economic growth if most policy attention and fiscal resources are being devoted to short-run crises.

Simultaneously, and creating tensions for the policies favoring long-run growth, policy makers must also find enough resources and efficient transfer mechanisms to ensure that the poor do not fall into irreversible poverty traps during times of

economic crisis, including food crises. These transfers can impose substantial fiscal costs and hence challenge the necessary investments for long-run growth. Design and implementation of these transfers involve human and political capital that also has real opportunity costs to the growth process. Thus, a focus on the broad downward arrow is necessary to ensure the continued viability and participation of poor households, but these activities have opportunity costs in terms of economic growth.

When the global economy is reasonably stable, and when food prices are well behaved, policy makers can concentrate their political and financial capital on the process of long-run, inclusive growth. Keeping the poor from falling into irreversible poverty traps is easier and less costly in a world of stable food prices, and the poor are able to use their own resources and entrepreneurial abilities to connect (via the small horizontal arrow) to long-run, sustainable food security for themselves. With success in achieving the objectives in the upper right and lower left boxes, market forces gradually—over decades—bring the poor above a threshold of vulnerability and into sustained food security (connecting macro to micro and short run to long run). The country has then managed the "escape from hunger" that Fogel documented for Europe and America in the late 18th and early 19th centuries and which a number of Asian countries have managed in the 20th century (Fogel 1991, 1994; Timmer 2004, 2005b).

By contrast, a world of heightened instability—in global finance and the world food economy—forces policy makers to concentrate their resources in the upper left box of Figure 1, where they are trying to stabilize domestic food prices and keep the poor from slipping more deeply, irreversibly, into poverty. Important as this effort is, it clearly comes at the expense of significant progress out of the short-run box on the upper left, both to the right and from top to bottom. From this perspective, instability is a serious impediment to achieving long-run food security. In a world of greater instability, induced by climate change, by new financial arrangements, even by the pressures from new political voices, food security is likely to suffer.

How can we fix this? The first step is to understand how the world of food security has changed in the past several decades. The starting point—where we have come from—reflects a broad political mandate in Asia to feed both urban and rural populations, the contributions of a technological revolution in rice (and wheat) that made this possible, and the role of rapid, inclusive economic growth in giving Asian households access to the food in their fields and markets (Timmer 2005a). What has changed is the structural transformation driven by these processes and the role of rice in the economy—Asia is now richer, more urban, better connected, and much better fed (Timmer 2009a). Asia's food marketing system is also being transformed before our eyes, as modern supply chains and supermarkets alter the nature of farm–market–consumer interactions (Reardon 2010). Finally, climate change really does seem to be upon us, with greatly increased uncertainty about weather patterns and corresponding increases in instability of production. As noted above, instability is a real problem for food security.

The following section highlights several of these trends, especially the changing role of rice in Asian agricultural production and household food consumption. A possible path forward, to make the world market for rice more reliable and hence trusted by Asian policy makers, concludes the paper. If successful, the Asian rice economy could become much better integrated and more stable.

The changing role of rice in Asia

Rice in production[3]

It is hard to imagine a more compelling picture of the changing role of rice in the global and Asian economies than the simple black-and-white data presented in Table 1. The objective of the table is simple: to show how structural transformation has altered the role of rice in the agricultural and overall economies of Asia and the rest of the world. The calculations, however, turn out to be complex. It is no wonder that these results will strike most readers as "new" and, perhaps, surprising.

Still, the approach is straightforward. The first step is to determine the share of cereal production in total agricultural production, something that is now possible with the new Food and Agriculture Organization (FAO) production index, which reports these values in 1991 international dollars, by country and for regional aggregates (Table 1, sections 1–3). At a global level, the share of cereals has not changed much from 1961 to 2007, rising slightly from 1961 (21.4%) to 1980 (24.4%), reflecting the productivity impact of the new technologies for rice and wheat. By 2007, however, the share of cereals had declined to 21.3% of total agricultural production, virtually unchanged from the 1961 value.

There is substantial regional variation in this pattern. The share of cereals in East Asia's total agricultural production rose from 33.7% in 1961 to 37.9% in 1980 before falling sharply to 19.4% in 2007. A rapid agricultural transformation was going on in East Asia after 1980, both cause and effect of the rapid economic growth in the region and its accompanying structural transformation. South Asia saw similar but more modest changes, as did Southeast Asia from a higher base. Africa, of course, relies much less heavily on cereals in its agricultural production, and there was little change in that pattern from 1961 to 2007.

The next step is to determine the role of rice in cereal production, something not possible directly from the FAO production index. An alternative approach is straightforward, however. Sections 4–7 in Table 1 use physical production of total cereals and of rice to calculate the share of rice in the total. In these calculations, the amount of rough rice is used in the comparison, despite the milling losses needed to produce an edible product. Although this approach tends to overstate the role of rice, an offsetting factor is that rice tends to be more valuable as a foodstuff per unit of weight, so the end result is about right. Further, whatever biases are introduced

[3] Timmer 2010e.

by this approach will not change much over time, and it is primarily the temporal patterns that are of interest.

Again, at the global level, the share of rice in total cereal production did not change a lot between 1961 and 2007, starting at 24.6% and rising gradually to 28.1%. But the regional patterns of change were quite dramatic. First, it is obvious that Asia relies far more heavily on rice than does the rest of the world, as East Asia's share of rice fell steadily from 56.2% in 1961 to 43.0% in 2007. A similar but slower decline from a higher base is seen in South Asia. Southeast Asia is very heavily dependent on rice—it accounted for 90.6% of cereal production in 1961, and rice still accounted for 85.9% of cereal production in 2007.

Perhaps surprisingly, Africa has steadily increased its production of rice over the past half century (by 3.5% per year since 1961), and also the proportion of rice in overall cereal production. In 1961, rice was 9.3% of total cereal production in Africa, and this share rose steadily to become 15.2% in 2007. Rice has become a significant cereal crop in Africa.

The final three sections of Table 1 show the calculations needed to understand the changing role of rice in overall agricultural production and for the entire economy. In Section 7, rice as a share of total agriculture is calculated by multiplying the values in Section 3 times the values in Section 6. The results are just arithmetic, but are interesting nonetheless. Rice has been about 5%–6% of agricultural production since 1961, but the share varies enormously by region. In East Asia, rice's share dropped from about a fifth of agricultural output to less than a tenth. Rice remains more significant in South Asia, contributing 15.2% in 2007. In Southeast Asia, rice contributed 40.2% of agricultural output in 1961, a figure that has dropped steadily, but slowly, since then. In 2007, rice still contributed 32% of agricultural output in Southeast Asia.

The share of rice in Africa's agriculture has been small, just 1.48% in 1961. But unlike the patterns in Asia, the share of rice in Africa is rising; it was 2.34% in 2007. Although still a small factor in Africa's overall agricultural production, it is clearly a commodity with a promising future.

Section 8 of the table reports the share of agricultural value added in overall gross domestic product (GDP), a value reported regularly in all countries' national income accounts and available in the World Development Indicators published by the World Bank. In its crudest form, this is the structural transformation. For the entire world, agriculture contributed a bit over 10% of economic output in 1961 and a bit less than 3% in 2007. These low numbers are the result of the economic dominance of rich countries in global GDP, and the very small contribution of agriculture in these economies.

Asia is much more dependent on agriculture, reflecting its historical structural dependence on smallholder farmers and the need to keep them profitably employed in agriculture even as the industry sector is expanding rapidly. The World Bank reports these data for East and Southeast Asia combined, and the

Table 1: Rice and the structural transformation: 1961–2007

				Avg. Annual % Change		
	1961	1980	2007	1961/ 1980	1980/ 2007	1961/ 2007
1. Total Agricultural Production, Value (in 1991 International $)						
World	607.5	956.0	1692.5	2.42	2.14	2.25
East Asia	73.8	142.3	414.1	3.52	4.04	3.82
South Asia	68.2	104.6	250.9	2.28	3.29	2.87
Southeast Asia	23.4	45.3	115.5	3.54	3.53	3.53
Africa	40.2	61.6	130.4	2.25	2.82	2.59
2. Total Cereal Production, Value (in 1991 International $)						
World	130.2	233.6	360.1	3.12	1.62	2.24
East Asia	24.9	54.0	80.3	4.16	1.48	2.58
South Asia	22.4	36.5	68.9	2.60	2.38	2.47
Southeast Asia	10.4	19.3	43.1	3.31	3.02	3.14
Africa	6.39	10.0	20.1	2.39	2.62	2.52
3. Cereal Production as % of Total Agricultural Production [2/1]						
World	21.4%	24.4%	21.3%			
East Asia	33.7	37.9	19.4			
South Asia	32.8	34.9	27.5			
Southeast Asia	44.4	42.6	37.3			
Africa	15.9	16.2	15.4			
4. Cereal Production, million metric tons (mmt)						
World	877.0	1550.2	2351.4	3.04	1.56	2.17
East Asia	140.3	306.2	480.3	4.19	1.68	2.71
South Asia	120.8	198.0	375.0	2.63	2.39	2.49
Southeast Asia	50.8	95.8	216.1	3.40	3.06	3.20
Africa	46.3	72.6	139.8	2.40	2.46	2.43
5. Rice Production, mmt						
World	215.6	396.9	659.6	3.26	1.90	2.46
East Asia	78.9	163.0	206.7	3.89	0.88	2.12
South Asia	73.6	112.2	206.9	2.24	2.29	2.27
Southeast Asia	46.0	84.5	185.7	3.25	2.96	3.08
Africa	4.31	8.61	21.3	3.71	3.41	3.53

				Avg. Annual % Change		
	1961	1980	2007	1961/ 1980	1980/ 2007	1961/ 2007
6. Rice as % of Cereal Production [5/4]						
World	24.6%	25.6%	28.1%			
East Asia	56.2	53.2	43.0			
South Asia	60.9	56.7	55.2			
Southeast Asia	90.6	88.2	85.9			
Africa	9.3	11.9	15.2			
7. Rice as a % of Agriculture [3x6]						
World	5.26	6.25	6.00			
East Asia	18.9	20.2	8.34			
South Asia	20.0	19.8	15.2			
Southeast Asia	40.2	37.6	32.0			
Africa	1.48	1.93	2.34			
8. Agricultural Value Added as % of Gross Domestic Product (GDP) [from World Bank]						
World	10.5	6.6	2.9			
East Asia[a]	36	29	12			
South Asia	42	35	18			
Southeast Asia[a]	36	29	12			
Africa	22	19	15			
9. Rice as % of GDP [7x8]						
World	0.552	0.413	0.174			
East Asia	6.80	5.86	1.00			
South Asia	8.40	6.93	2.74			
Southeast Asia	14.47	10.90	3.84			
Africa	0.326	0.367	0.351			

[a] East Asia and Southeast Asia are combined in the World Bank regional aggregates for agricultural value added as a % of GDP.

Source: Data from Food and Agriculture Organization and World Bank. Calculations by author. See Timmer 2010e.

share of agricultural value added in overall GDP declined from 36% in 1961 to 12% in 2007.[4] The share of agriculture in South Asia's economy is higher, starting at 42% in 1961 and declining to 18% in 2007. The share of agriculture in Africa's economy is surprisingly low, but it has even declined, from 22% in 1961 to 15% in 2007.

The contrast between Asia and the rest of the world is sharp: in 1961, agriculture was 3.7 times as important to Asian economies as to the world as a whole (taking the simple average of East Asia and South Asia). This ratio had climbed to 5.2 times as important in 2007. Despite the rapid transformation of Asian economies, agriculture remains very important. This is mostly because Asian economies remain, on average, very poor; but it is also because the huge number of small farmers in Asia cannot be moved to urban industrial and service jobs in just a few decades, even with rapid economic growth. Structural transformation takes generations, and the stress on agricultural families to adjust is greater the faster the economy grows.

Finally, Section 9 provides the "bottom line" to our question: How has the role of rice changed? At a world level, rice accounted for just over one half of one percent of GDP in 1961. Over the next half century, the share of rice in GDP for the entire world fell to just 0.174% of GDP. In terms of overall economic output on a global scale, rice is a very small factor.[5]

In Asia, rice is far more important, although its share in national economies is not as large as many observers think. Even in 1961, rice accounted for just 6.8% of GDP in East Asia, 8.4% in South Asia, and 14.5% in Southeast Asia. Naturally, because of the structural transformation and the declining role of agriculture in successfully growing economies, and the agricultural transformation, where farmers diversify out of low-value rice production, the share of rice in Asian economies (share of GDP) has declined very rapidly. In 2007, it was just 1.0% in East Asia, 2.7% in South Asia, and 3.8% in Southeast Asia. So, even in Asia, rice is less important *economically* than livestock, construction, or transportation, or even banking. Total employment in the rice economy may still rival these other sectors, but that is because the economic returns to working in the rice sector are so low—a failure of the structural transformation to absorb rural workers fast enough.

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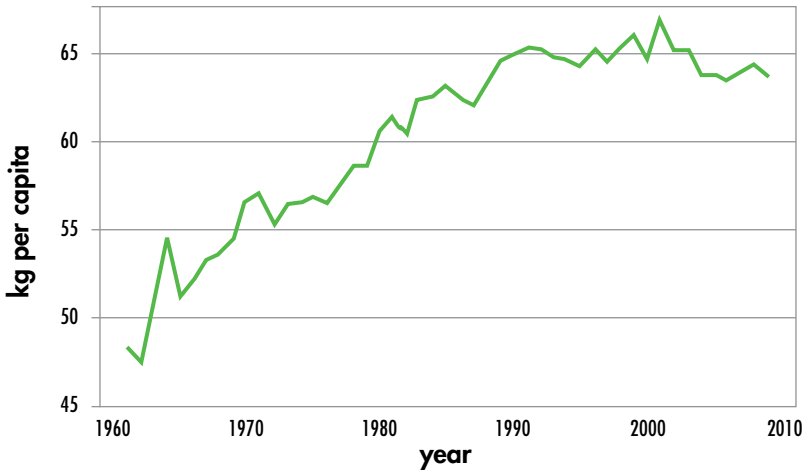
[4] If the major agricultural producers of Southeast Asia (Indonesia, Malaysia, Philippines, Thailand, and Viet Nam) are examined as a regional aggregate separately, the share of agricultural value added to GDP was 40.9% in 1961, 38.6% in 1970, 26.9% in 1980, 21.9% in 1990, 16.4% in 2000, and 14.5% in 2007. Most of the remainder of the World Bank regional aggregate of "East Asia and the Pacific" is then composed of the People's Republic of China (PRC). The share of agriculture in the PRC's GDP was 36%, 35%, 30%, 27% 15%, and 11% from 1961 to 2007, by decade.

[5] These are production shares of rice to value added and do not include the value of processing and marketing. The share of rice at the level of consumption is probably about half again as large. See the following discussion of rice in consumption.

Rice in consumption

Momentous changes are also under way in rice consumption, especially in Asia (see Figures 2 and 3). New data, extensive econometric analysis, and a historical perspective help us understand the underlying dynamics of these changes (Timmer, Block, and Dawe 2010). The result will surprise many readers, as the projections suggest a significant decline in global rice consumption in the next four decades, starting in just 10–20 years. The main drivers of this decline will be rapid income growth in Asia, accompanied by a massive shift of labor from rural to urban areas. The impact of these two drivers is especially vivid in Figure 3, which shows the annualized change over at least a two-decade period in the quantity of rice consumed per capita per week, by rural and urban households separately, according to which income quintile they fall into, for Bangladesh, India, and Indonesia. The sharp negative trend with respect to incomes, and between urban and rural households, is striking.

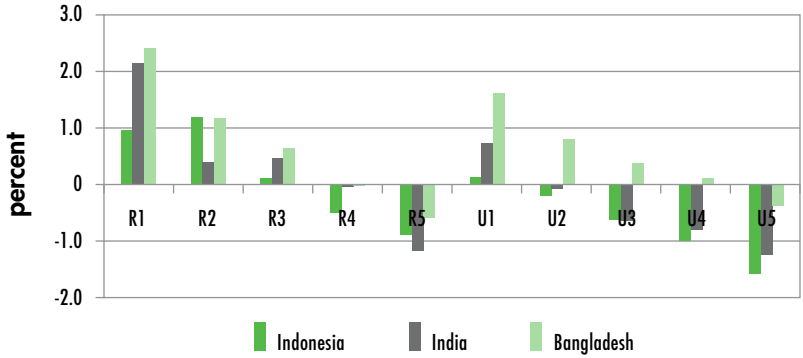
Figure 2: Trend in global rice consumption per capita (kilograms per capita), 1961–2008



Source: Timmer, Block, and Dawe 2010.

With more open trade and the globalization of tastes, a shift to more balanced diets in Asia—less rice and more wheat, animal products, fats, oils, vegetables, and fruits—means a decline in rice consumption. The foundations of this decline have been apparent in the global data since the early 1990s, when the aggregate income elasticity of demand for rice turned negative. Per capita consumption of rice peaked about the same time (Figure 2). Projecting forward, global rice consumption is expected to rise from the 441 million metric tons (mmt) consumed in 2010 to about 450 mmt in 2020, before declining to just 360 million metric tons in 2050.

Figure 3: Annualized percentage change in rice consumption by quintile and location: Bangladesh, India, and Indonesia



Note: R refers to rural quintiles, U to urban quintiles. Periods over which changes are calculated are 1967–2006 for Indonesia, 1983–2005 for India, and 1983–2005 for Bangladesh.
Source: Timmer, Block, and Dawe 2010.

From a food security perspective, the changing role of rice in Asian diets has three clear implications: First, the overall importance of rice to Asian consumers as a source of calories is gradually declining (Table 2). Rice as a share of calories for all of Asia (as defined by FAO, with data from its food balance sheets) peaked in 1970 as the Green Revolution got under way, with 38.2% of the average Asian household's calories coming from rice. That share has steadily declined, falling to 29.3% in 2007. What is particularly striking about this decline is its acceleration. The share fell by 0.25% per year between 1961 and 1990, but by 1.00% per year from 1990 to 2007. If Asian policy makers are worried about where their constituents get their daily food, over 70% of the answer is from the nonrice economy. And that number reflects the *calorie* dimensions of food; Asian consumers are now spending less than 5% of their food *budgets* on rice.

Second, however, the total size of rice demand remains important, because rice remains the largest *single* source of calories for a significant majority of Asian consumers. This point returns the discussion to the production situation, wherein yield growth has stagnated and many key rice-growing basins are threatened by short-run environmental degradation and long-run impacts from climate change. But precisely because rice production is facing serious challenges, and is likely to be more unstable in the future, most countries in Asia need to increase their participation in the world rice market and trade, not seek localized self-sufficiency. A strategy for building trust in the world rice market is presented below.

Third, there is great country variance in the role of rice in Asian food consumption, and in how that role is changing (Table 3). On average, India

Table 2: The changing role of rice in food consumption in Asia

Year	Total Calories	Calories from Rice	Rice as % of Total
1961	1805	656	36.3
1970	2069	790	38.2
1980	2200	797	36.2
1990	2443	848	34.7
2000	2606	803	30.8
2007	2668	783	29.3
	Average Annual	% Increase/(Decrease)	
1961–1970	1.53	2.09	0.57
1961–1990	1.05	0.89	(0.25)
1970–2007	0.69	(0.03)	(0.71)
1990–2007	0.52	(0.47)	(1.00)

Source: Data from FAO Food Balance Sheets. "Calories" are daily per capita energy intake.

consumed just 703 kilocalories (kcal) of rice per capita per day in 2007, a sharp contrast with the 1,629 kcal consumed in Viet Nam. Still, rice consumption in Viet Nam accounted for "only" 57.8% of total caloric intake, whereas the share in Bangladesh was 69.8% in 2007.

Excepting only the Philippines, that share has been falling since 1970 or 1980 in all the countries shown in Table 3, and the fall has been especially rapid in the Republic of Korea—from 49.8% in 1980 to 26.8% in 2007—and in the People's Republic of China (PRC)—from 38.7% in 1970 to 26.8% in 2007. But the drop is also noticeable in Bangladesh—from 75.2% in 1990 to 69.8% in 2007—and in Indonesia—from 56.1% in 1980 to 48.8% in 2007. In all of these countries except Bangladesh (and, again, the Philippines), the drop in the share of rice has also been accompanied by at least a modest fall in the total consumption of rice. Only population growth continues to drive rice consumption upward in Asia, and population growth is slowing in most countries.[6]

[6] The Philippines case is interesting and hard to explain. The share of rice in the average Filipino diet declined steadily from 1961 to 1990 under the pressures of rapid population growth, slow growth in domestic rice production, and a lagging economy. The share has since increased 9 percentage points to 2007, with daily rice intake rising 1.7% per year since 1990. Substitution away from corn, sharply higher rice imports to support political campaigns, apparent success in the domestic rice production program, and increased rice consumption among the poor because of extensive subsidies may account for these trends.

Table 3: The changing role of rice in food consumption: Specific countries

Year	Total Calories	Calories from Rice	Rice as % of Total
Bangladesh			
1961	1,982	1,575	79.5
1970	2,108	1,584	75.1
1980	1,846	1,311	71.0
1990	1,960	1,473	75.2
2000	2,125	1,522	71.6
2007	2,281	1,591	69.8
People's Republic of China			
1961	1,469	444	30.2
1970	1,887	730	38.7
1980	2,206	798	36.2
1990	2,612	872	33.4
2000	2,908	831	28.6
2007	2,981	799	26.8
India			
1961	2,030	663	32.7
1970	2,134	692	32.4
1980	1,991	638	32.0
1990	2,220	781	35.2
2000	2,314	719	31.1
2007	2,352	703	29.9
Indonesia			
1961	1,743	826	47.4
1970	1,882	1,032	54.8
1980	2,220	1,245	56.1
1990	2,356	1,301	55.2
2000	2,498	1,305	52.2
2007	2,538	1,238	48.8
Republic of Korea			
1961	2,141	1,070	50.0
1970	2,815	1,368	48.6
1980	3,023	1,504	49.8
1990	2,956	1,052	35.6
2000	3,061	945	30.9
2007	3,074	825	26.8
Philippines			
1961	1,738	823	47.4
1970	1,775	769	43.3
1980	2,246	932	41.5
1990	2,254	915	40.6
2000	2,407	1,019	42.3
2007	2,565	1,271	49.6
Viet Nam			
1961	1,876	1,378	73.5
1970	2,056	1,422	69.2
1980	1,988	1,341	67.5
1990	2,098	1,524	72.6
2000	2,493	1,657	66.5
2007	2,816	1,629	57.8

Current challenges to food security in Asia[7]

One advantage of a long-term perspective is the realization that food security challenges are never fully met, and they can change radically in a short period. Shortages give way to surpluses and back again; large rice reserves become a financial burden when surpluses are available and prices are falling, but are welcome when regular import supplies are embargoed or when severe drought hits and prices rise rapidly; the efficiency of rice trade for both exporters and importers can be disrupted by political demands for self-sufficiency as the only way for a large country to ensure food security for its citizens, but the high prices required soon meet consumer resistance. Food security is all about trade-offs in both the short run and the long run (Timmer 2010d).

These trade-offs were presented in a particularly vivid fashion by the Prime Minister of Bangladesh, Sheikh Hasina (2010), in her opening speech to the Bangladesh Food Security Investment Forum 2010. A short excerpt provides the essential message:

> The unprecedented food crisis of 2007–2008 has compelled the entire world to attach high priority to food security. Particularly it has proven the international market as an unreliable source of food at times of crisis and reminded us [of] the need to exploit whatever comparative advantage we have in food production. In Bangladesh, the crisis has signaled a policy shift from self-reliance to self-sufficiency.

A policy shift from using export earnings to finance the import of rice to producing more rice domestically is perfectly understandable under the circumstances of the past several years, and has direct consequences for one of the issues here—the changing role of international markets in providing food security. We all understand that markets, as an institutional mechanism for allocating resources, are absolutely essential because of their speed in processing information. All economies, no matter how poor or simple, must handle billions of bits of data every day, and facilitate transactions that usually number in the hundreds of millions per day. No other institutional mechanism can allocate resources as efficiently as markets. We know this because societies over time have tried every other possibility.

The widespread and persistent search for an alternative to markets as the organizing framework for a society's economic activities has a deep underlying rationale.

Markets
— often (thinks the political left),
— sometimes (thinks the political center), or
— rarely (thinks the political right)

[7] Much of this section draws on a presentation to the Bangladesh Food Security Investment Forum, Dhaka, 26–28 May 2010 (Timmer 2010c).

fail to produce an outcome that is satisfactory to groups of individuals, or even to society as a whole. In particular, we may not like the *distribution* of the outcome from a market economy (in terms of incomes and asset ownership), and we may not like the *instability* of those outcomes (in terms of food prices, in particular).

An alternative to free markets?

Is it possible to have an efficient market economy and still influence its distribution of income and the stability of food prices? Since the 1970s, most economists and aid agencies have said "no." We have to have "free" markets, goes the view, or they will not produce rapid economic growth. Policy advice and structural adjustment programs have invariably pushed countries to liberalize markets, even if that meant worsening income distribution and greater instability in prices.[8]

We have now learned that "no" is the wrong answer.[9] Over the past decade, individual countries have demonstrated that "inclusive" economic growth is possible if investments are made in agriculture, rural infrastructure, education, and health, and the macro economy is stimulated by sound fiscal policy, a competitive exchange rate, and a reasonably open (but not "free") trade regime (Timmer 2005a). That is, the distribution of benefits from economic growth can be affected by public policy without necessarily slowing the overall rate of growth. This critical lesson has still not been learned in most of the aid community.

At the same time, food prices within a country *can* be kept reasonably stable with respect to world prices, especially for rice in Asia (Timmer and Dawe 2007). There are often spillovers from the actions undertaken by countries to stabilize their domestic prices, and these spillovers increase price instability in world markets. A little-researched topic is how to *minimize* the impact of these spillovers, or to *cope* with them on a country-by-country basis, rather than to follow the standard policy advice, which is to *avoid* the actions altogether, and thus avoid the spillovers in the first place. *The standard policy advice turns out to be politically impossible in times of turbulent markets.* Is there a better alternative?

The mainstream economic development profession has long questioned whether stabilizing domestic food prices is

[8] Of course, the market environment in a great many countries was improved by liberalization, and economic growth did accelerate. The point is that the side effects were dismissed as unimportant, or even unlikely to occur, so no policy planning was instituted to cope with them.

[9] Not for the first time, of course. The lesson also seemed to have been learned during the Great Depression.

(1) desirable,[10] or

(2) feasible.[11]

After the world food crisis of 2007–2008, it is time to rethink that analytical position and the policy advice that stems from it. Three things would move the agenda forward:

We need a serious new research program on the benefits and costs of stabilizing food prices *within domestic economies*, including a focus on implementation of policy, management of food logistics agencies, and instruments to control corruption in these agencies. We would know a lot more about these topics if we had spent the same resources answering these questions as we have spent over the past three decades in estimating the gains from free trade in agriculture.

We need serious new confidence-building measures to renew trust in the world rice market. Very severe damage to this trust was inflicted during the 2007–2008 food crisis, mostly because of the Indian ban on exports; the on-again, off-again ban on Vietnamese rice exports; and open talk in Thailand of withholding stocks from the market and creating an "OREC," or Organization of Rice Exporting Countries, to boost prices in the world market. Still, there is plenty of blame to go around in explaining the growing political distrust of the world market for rice. Important importing countries such as Indonesia and the Philippines speak publicly of their desire to end "dependence" on supplies from the world market. Such rhetoric does not make them a market that exporting countries can trust (although this rhetoric also has little impact on rice traders, who tend to judge market impact from actions rather than political statements).

This retreat into autarky comes at a very high price to economic efficiency and to the welfare of poor consumers. It makes the world market even more unstable and less reliable. Is there anything we can do to rebuild confidence and trust in international trade in general and in the world rice market in particular? Any

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[10] The desirability of stabilizing food prices is questioned by standard models of international trade and of intertemporal storage, where greater price variance generates greater opportunities for trade, with commensurate gains in producers and/or consumers surplus. See Timmer 2010a for a review of this approach and an incorporation of insights from behavioral economics into the food security debate.

[11] For a good review of this thinking, see the World Bank (2005) compendium of papers presented at a conference on managing agricultural price risk in an environment of market liberalization. At that conference, Kym Anderson of the University of Adelaide and lead author of the massive World Bank research program on "distortions of agricultural incentives" argued that "price instability is your friend," because it stimulates appropriate responses from producers and consumers to cope with the inevitable instability in food supplies that is caused by weather, pests, and diseases. In a more recent paper, Brian Wright of the University of California, Berkeley, has argued that stabilizing food prices is simply not feasible. See World Bank (2005), Anderson (2009), Anderson and Martin (2009), and Wright (2009). The basic analysis in this debate is by Newbery and Stiglitz (1981), although they concentrate almost entirely on international mechanisms to stabilize commodity prices, not domestic actions.

confidence-building measures will need to involve both exporting and importing countries, *acting in their own self interest*. One possibility is a country-by-country investment in greater rice reserves to cope with *shocks* to rice supplies, while gradually increasing the use of trade to *lower costs* of rice consumption. A higher level of stocks does not alter the requisite flow of rice from producers to consumers, but it does create a buffer against interruptions to that flow.

We need larger rice reserves at four levels of the global rice economy—those held by the private sector; in small importing countries by the public sector; in large rice-producing and -consuming countries, held publicly; and internationally.

Most of the rice stocks in the global economy are held by the private sector—farmers, traders, processors, retailers, and consumers—to even out seasonal production patterns and to keep trade pipelines flowing smoothly. Few private stocks are held to even out interannual price fluctuations, but the pipeline stocks carried across crop-years are probably equal to a month or two of consumption, a considerable quantity. With greater price instability expected in the future, and greater uncertainty about the reliability of supplies in world markets, optimal (profit-maximizing) levels of privately held rice stocks will increase (Williams and Wright 1991). Although we know little about the actual levels of these stocks, or the behavioral parameters that affect them, even the most basic models of supply of storage suggest there will be a significant increase in privately held rice stocks going forward. Of course, if publicly held stocks succeed in stabilizing world rice prices, privately held stocks will then gradually be drawn down.

A completely overlooked potential for the private sector to provide greater stability of rice prices through stock management comes from the "supermarket revolution" in Asia (Timmer 2009b; Reardon 2010). Before the turn of the millennium, supermarkets in the region were niche players, catering mostly to the urban middle and upper classes. Now they probably provide—via modern supply chains—perhaps a third to as much as half of the rice consumed in East and Southeast Asia, with the share growing rapidly (although even the rough numbers are not really known).

The potential of modern supermarkets to stabilize rice prices comes from the large market share of individual companies, under central management control. If consumers *desire* stable food prices, astute supermarket managers can *supply* it. This potential to stabilize prices contrasts with traditional small, competitive retail rice markets, where prices change regularly on the basis of daily supply and demand. Historically, "food price stability" has been a *public* good, because no private entity found it profitable to provide it. The rise of supermarkets may mean that stable food prices could become primarily a *private* good. This would truly be a revolution in the food industry.

Next, for similar reasons, small countries that rely heavily on imports for their rice supplies such as Malaysia, Singapore, and Brunei Darussalam will find it desirable to increase the level of stocks held publicly, or (as in Singapore) held

privately but with levels determined by public regulations.[12] Even a modest increase in rice stocks in these countries will increase confidence that the world market remains their best long-run source of supply (which, of course, it is).

Large countries face a somewhat different situation. Because of the sheer size of their *domestic* rice economies, actions to increase production, reduce consumption, or alter the size of stocks held by public agencies will also have a noticeable impact on the *international* rice economy. These countries certainly include the PRC and India, probably Indonesia, and possibly, Bangladesh and the Philippines.[13] Larger rice reserves in these countries are probably desirable for reasons of domestic food security, but they will also alter the perception of global observers about the adequacy of worldwide stocks. That is, larger rice reserves in these countries will have a positive spillover impact on the global rice economy by stabilizing price expectations, and thereby actual rice prices. An important question for the international community, especially the major aid agencies, is whether any actions can be taken to encourage the gradual buildup of rice reserves in these large countries.

A role for the international community?

Finally, the hardest question is whether there is any role for international ownership and control of rice stocks as a means to stabilize rice prices on global markets. Ever since the publication of the classic Newbery and Stiglitz volume on *The Theory of Commodity Price Stabilization* in 1981, the answer has been a clear "no." Both history and theory demonstrate that it is impossible to stabilize the price of a commodity in world markets for long periods of time—from cocoa to coffee to copper to tin to wheat to whatever—using internationally managed buffer stocks. Budget constraints and the asymmetry of storage—it can never be negative—mean that stochastic variations in supply or demand will eventually overwhelm the ability of a buffer stock to stabilize prices (Newbery and Stiglitz 1981; Williams and Wright 1991; Wright 2009). No international commodity agreement with binding provisions has been negotiated since the Newbery and Stiglitz volume.

Still, it is important to address a more modest question: Would the availability of a limited amount of rice under international control help stabilize *expectations* about the behavior of world rice prices? If expectations can be stabilized, panicked

[12] To obtain a license to import rice into Singapore, the trading company must agree to hold 3 months of normal consumption in storage. In view of the increased instability and uncertainty in the world rice market, expanding these stocks to 3.5 or even 4 months of supplies probably makes sense. Of course, higher storage costs will be incurred. which will have to be paid by consumers.

[13] Thailand and Viet Nam, as the world's leading rice exporters, carry substantial stocks both seasonally and as part of their normal pipeline for regular deliveries to their customers. They are unlikely to need larger stocks for food security reasons.

behavior on the part of multitudinous participants in the world rice economy could be sharply reduced, with self-reinforcing price bubbles and collapses made less frequent and less extreme (Timmer 2009a). The availability of international stocks would not need to keep rice prices within some legally specified band, but could be available if world rice supplies suddenly tightened and prices threatened to spike. Is this more limited objective possible?

Four possibilities for holding international rice stocks

There are four levels at which this question should be addressed. First would be within Asia: the Association of Southeast Asian Nations (ASEAN)+3 (which includes the PRC, Japan, and Republic of Korea), or possibly a new ASEAN+6 (to include also Bangladesh, India, and Pakistan), would include nearly all of the world's major rice importers and exporters (except the United States), not to mention about 90% of world production and consumption. An expanded ASEAN rice buffer stock has been under "active" consideration for years, with little discernible progress. How do we stimulate such progress, beyond the steps under way to improve information flows and policy coordination? Would an agreement to focus on a specific quality of rice, say 25% broken long-grain rice, help build confidence that the reserve could help meet demand from the poorest consumers when prices spike?

Second, by an accident of international trade negotiations and strong protection of domestic rice producers, Japan holds over 1.5 mmt of high quality "foreign" rice that it imports under its World Trade Organization agreement but which it refuses to sell to domestic consumers. The *potential* availability of this rice in May of 2008 was sufficient to prick the rapidly exploding rice price bubble at that time (Slayton and Timmer 2008). Would it be possible to manage these Japanese stocks with a more active concern for movements in international rice prices?

Third, could Australia, under Australian Agency for International Development (AusAID) auspices, use its mostly redundant rice industry to build up stocks of rough rice from surplus countries in Asia (shipping it to Australia in otherwise empty cargo carriers that go up to Asia filled with coal, iron ore, or bauxite) and then offer these stocks, after milling, back to the world market when rice supplies get tight? The Australian rice industry has an excellent record of managing rice stocks and shipments and has little vested interest in exploiting price movements on the international rice market. Could Australia provide an important international public good by helping to stabilize world rice prices?

Finally, the question inevitably comes up: Can the international community itself commit to publicly managed international rice stocks that would be an effective stabilizer of world rice prices? At the height of the world food crisis, the International Food Policy Research Institute put forward a proposal to create "virtual reserves" of grain to dampen financial speculation on world grain markets (von Braun and Torero 2008). Whatever the merits of such reserves for wheat, maize, and soybean, they clearly will not work for rice. Without deep futures

markets and with less-than-transparent price discovery in the world market, virtual reserves for rice will not influence real participants in real transactions (Timmer 2009c).

The historical record on managing an international commodity agreement, with fixed price bands and the ownership of physical stocks, is not encouraging, and it was never even tried for rice because of the difficulties of stock deterioration, quality variations, and poor information on the prices of actual rice trades. None of those problems have gone away. Probably the best that could be done from an international perspective is for the major aid agencies interested in rice—the World Bank, the Asian Development Bank, the United States Agency for International Development, AusAID, and perhaps the Bill & Melinda Gates Foundation—to agree on modest incentive payments to large rice-consuming countries to store more rice, at the margin, than they would store under normal conditions. Knowledge of the size of such stocks (a necessary condition for receiving incentive payments to hold them) would be an important stabilizing element for participants in the world rice trade, even if the trigger mechanisms for stock release, domestically or internationally, were not enforceable by the international community.

The proposals here are incremental. They seek to change the long-run incentives for stockholding behavior and to use increased stocks to build confidence in the international market for rice, which is clearly the most efficient source of supply for many countries. Because holding larger stocks will turn out to be very expensive, a scenario can be imagined where the larger stocks gradually build renewed confidence in the world rice market, prices become more stable, and stocks will then be reduced gradually as the reality of the fiscal burden sinks in.

The policy discussion here has been almost entirely about stocks and trade, with little discussion of policy initiatives needed in the spheres of production and consumption. There has been little discussion of access by poor households to rice—the basis of food security for individuals. Such a discussion would focus much more on the causes of poverty and approaches to reducing it in a sustainable fashion.

These are the truly important variables in the world rice market. Productivity growth in rice production has slowed visibly in the past two decades, and renewed investments in speeding that growth are urgently needed. Rice consumption patterns are changing rapidly, with consumption by the poor rising (often stimulated by subsidies) and consumption by the better-off, especially urban, households, falling. The world rice economy, and the various domestic participants in it, is a dynamic system subject to shocks and self-reinforcing behavior that creates price spikes and collapses. This instability has enormous costs, economically and politically, to farmers and consumers. Now that rice is no longer the overwhelming determinant of food security for most of Asia's consumers, or of income for its farmers, we should be able to do better for a commodity that feeds two-thirds of the world's poor.

References

Anderson, K., ed. 2009. *Distortions to Agricultural Incentives: A Global Perspective, 1955–2007*. Washington, DC: Palgrave MacMillan and The World Bank.

Anderson, K., and W. Martin, eds. 2009. *Distortions to Agricultural Incentives in Asia*. Washington, DC: The World Bank.

Dawe, D., ed. 2010. *The Rice Crisis: Markets, Policies and Food Security*. London and Washington, DC: Earthscan.

Fogel, R. W. 1991. The Conquest of High Mortality and Hunger in Europe and America: Timing and Mechanisms. In *Favorites of Fortune: Technology, Growth, and Economic Development since the Industrial Revolution*, ed. P. Higonnet, D. S. Landes, and H. Rosovsky, 35–71. Cambridge, MA: Harvard University Press.

Fogel, R. W. 1994. Economic Growth, Population Theory, and Physiology: The Bearing of Long-Term Processes on the Making of Economic Policy; Nobel Prize Lecture. *American Economic Review* 84 (3) (June): 369–395.

Sheikh Hasina, 2010. Speech of the Honorable Prime Minister at the Inaugural Ceremony of the Bangladesh Food Security Investment Forum 2010, Pan Pacific Sonargaon Hotel, Dhaka, Bangladesh, 26 May, pp. 1–6.

Newbery, D. M. G., and J. E. Stiglitz. 1981. *The Theory of Commodity Price Stabilization: A Study in the Economics of Risk*. Oxford: Clarendon Press.

Reardon, T. 2010. Linking Food Market Transformation to Improved Food Security in Asia. Presentation at the ASEAN Food Security Conference, Singapore, June 17. Organized by Nathan Associates, Arlington, VA, with support from USAID.

Slayton, T., and C. P. Timmer. 2008. Japan, China and Thailand Can Solve the Rice Crisis—But U.S. Leadership is Needed. CGD Notes, Center for Global Development, Washington, DC. May, pp. 1–6.

Timmer, C. P. 1996. Does BULOG Stabilize Rice Prices in Indonesia? Should It Try? *Bulletin of Indonesian Economic Studies* (Canberra) 32 (2) (August): 45–74.

_____. 2004. The Road to Pro-Poor Growth: Indonesia's Experience in Regional Perspective. *Bulletin of Indonesian Economic Studies* 40 (2) (August): 177–207.

_____. 2005a. Food Security and Economic Growth: An Asian Perspective. Heinz W. Arndt Memorial Lecture, Canberra: The Australian National University, November, 2004. *Asian–Pacific Economic Literature* 19 (1) (May): 1–17.

_____. 2005b. Agriculture and Pro-Poor Growth: An Asian Perspective. Working Paper No. 63, Center for Global Development, Washington, DC.

_____. 2009a. A World without Agriculture: The Structural Transformation in Historical Perspective. Henry Wendt Lecture. Washington, DC: American Enterprise Institute.

_____. 2009b. Rice Price Formation in the Short Run and the Long Run: The Role of Market Structure in Explaining Volatility. Center for Global Development Working Paper 172, May, pp. 1–46.

_____. 2009c. Do Supermarkets Change the Food Policy Agenda? *World Development,* Special Issue on Agrifood Industry Transformation and Small Farmers in Developing Countries, guest edited by T. Reardon, C. B. Barrett, J. A. Berdegué, and J. F. M. Swinnen. Vol. 37, no. 11 (November): 1812–19.

_____. 2010a. Reflections on Food Crises Past. *Food Policy* 35 (1): 1–11.

_____. 2010b. Behavioral Dimensions of Food Security. Proceedings of the National Academy of Science, special feature on agricultural development and nutrition security, electronic version published September 21.

_____. 2010c. Rice and the Structural Transformation. Paper prepared for the 50th Anniversary Volume of the International Rice Research Institute (IRRI), Los Baños, Philippines.

_____. 2010d. Food Security in Asia: The Role of Larger Rice Reserves to Build Confidence in Trade. Paper presented at the Bangladesh Food Security Investment Forum, 26–27 May 2010, Dhaka. IFPRI Policy Note, June 9.

_____. 2010e. Did Speculation Affect World Rice Prices? In *The Rice Crisis: Markets,*

Policies and Food Security, ed. David Dawe, 29–60. London and Washington, DC: Earthscan.

Timmer, C. P., and D. Dawe. 2007. Managing Food Price Instability in Asia: A Macro Food Security Perspective. *Asian Economic Journal* 21 (1) (March): 1–18.

Timmer, C. P., S. Block, and D. Dawe. 2010. Long-run Dynamics of Rice Consumption. Paper prepared for the 50th Anniversary Volume of the International Rice Research Institute (IRRI), Los Baños, Philippines.

von Braun, J., and M. Torero, 2008. Physical and virtual global food reserves to protect the poor and prevent market failure. *Policy Briefs* 4, Washington, DC: International Food Policy Research Institute (IFPRI).

Williams, J. C., and B. D. Wright. 1991. *Storage and Commodity Markets*. Cambridge, UK: Cambridge University Press.

World Bank. 2005. *Managing Food Price Risks and Instability in an Environment of Market Liberalization*. Agriculture and Rural Development Department Report No. 32727–GLB. Washington, DC.

Wright, B. D. 2009. International Grain Reserves and Other Instruments to Address Volatility in Grain Markets: Issues and Options. Technical Background Paper for the World Grain Forum, May, Russia. University of California, Berkeley.

Chapter 5

Investments for enhancing productivity

With world population projected to reach 9 billion by 2050, food production will need to increase by 70%, according to FAO. Enhanced productivity is thus important, especially in existing cultivable lands where production is on a small scale and water resources are highly stressed. Session 2 organized by FAO in the Investment Forum presented the experiences of a private agribusiness entity adopting good agricultural practices, an agriculture institute promoting science-based research, and a development partner's findings on water use management.

Harnessing the potential of smallholder farm organizations

Thailand's Swift Company

Paichayon Uathaveekul
Chairperson
Swift Company of Thailand

A private firm in Thailand is partnering with smallholder farm groups in developing a win–win model for the promotion of GAP, agricultural extension, and communications to market premium quality fresh produce.

It takes a giant step for smallholder farmers to shift from traditional farming practices to applying the knowledge-based principles of good agricultural practices (GAP) in farming. The adoption of GAP can be achieved only through long-term intensive training, capacity development, and giving farmers a strong incentive to learn and conform to the guidelines of GAP. The experience of Swift Company in Thailand shows that farmers can learn and implement GLOBALG.A.P. and organic farming with appropriate training *and* if higher prices for their farm produce can be guaranteed.

GLOBALG.A.P. is a private sector body that sets voluntary standards for the certification of production processes of agricultural and aquacultural products around the world. The GLOBALG.A.P. standard is designed primarily to reassure consumers about how food is produced on the farm by minimizing detrimental environmental impacts of farming operations, reducing the use of chemical inputs, and ensuring a responsible approach to worker health and safety as well as animal welfare.

A Swift project in Srakaew Province, Thailand demonstrates that farmers are willing to learn and grow organic asparagus under contract, even when they have had no experience in organic farming or asparagus production. The technical success and streams of high income realized by two small core groups of farmers led to the rapid expansion of organic asparagus farming. Swift Company has determined that streams of high and steady income are a key success factor in sustaining the application of GLOBALG.A.P. and organic farming practices by its contracted grower groups in Thailand.

Long-term and intensive training and capacity development programs are the key requirements for helping smallholder farmers to understand the

principles of knowledge-based farming and to put these into practice. Training programs must be broadly based. In addition to addressing technical issues such as preharvest practices, farm maintenance, and harvest and postharvest techniques, they must address appropriate management training on administration; financial management, including bookkeeping; and the guidelines of the group's charter. Training must promote a change in attitude and must be conducted on a frequent basis over the long term.

The training programs of the Swift Company are divided into four parts:

- Guidelines and principles of selected practices
- Farm production techniques and farm hygiene
- Administration and management of the group
- Attitude development

Issues and challenges

The majority of smallholder farmers in developing countries are caught up in a poverty cycle wherein they live at the subsistence level without the required resources to improve their farms. A number of major constraints prevent them from escaping this cycle:

- Lack of direct access to markets by smallholder farmers results in their continued dependence on the services of middlemen and traders.
- Inefficient multitier chains, wherein farm produce repeatedly changes hands, result in incremental expenses and profit taking. Under normal circumstances, the produce must still be competitively priced in the market, and entrepreneurs/traders cannot freely add profit margins. To maintain or increase their margins, they reduce buying prices at the farm whenever and wherever possible.
- Wholesale markets in Thailand and many other Asian countries are "spot markets" (price reflects spot demand and supply) wherein spot prices fluctuate greatly and frequently. Entrepreneurs/traders try to limit their exposure to risk by buying at the lowest possible price.
- Poor logistics and poor handling in the supply chain from farm to market cause severe damage to fresh farm produce, resulting in considerable wastage. These losses are transferred to growers, resulting in lower prices at the farm gate.
- Market mechanisms often work against small growers, even if they are organized into groups or cooperatives. Fresh produce supplies are delivered on a daily basis to wholesalers by "regular suppliers" who are capable of organizing supplies from different geographical sources to meet the daily demand of wholesalers on a year-round basis. These relationships are generally built on trust and mutual benefit. It is very difficult for groups of growers or cooperatives to break into these supply webs, since they are not in a position to supply the range of cash crops required on a daily basis.

Smallholder farmers in developing countries therefore always face the risks of farming alone. Their exposure to risk is significantly increased by extreme weather conditions. Frequent losses in farm production increase their debt burden, often to the point that they eventually lose their farm lands and have to operate on leased land, become wage earners in the agriculture sector, or serve as unskilled labor in the industry and service sectors.

Given the small farm size of most producers, any addition to their net incomes must be derived from either an increase in the value of farm output or a reduction in farming costs, or both. Small farmers must therefore be exposed to proven technologies and practices that are cognizant of local conditions and improve net returns per unit of land. They will be in a position to invest in farm improvement geared toward increasing farm productivity only when they can realize high and steady flows of income over extended periods. Investments in technologies, practices, and farm improvement will significantly increase productivity outputs in the long term.

Organic farming practices can significantly reduce the costs of smallholder farmers in Thailand. Small farms are generally family managed. Conversion to organic farming does not necessitate the engagement of additional farm workers. By refraining from the use of relatively expensive inputs such as chemical fertilizers and other agrochemicals, the input costs of small farmers can be significantly reduced and labor costs maintained at the same level. By shifting to organic farming practices, smallholder farmers can therefore turn farm size constraints into advantages in terms of lower production cost, higher selling price per unit of produce, and increased opportunity to access markets. In developed countries, where labor costs are generally much higher and average farm sizes larger, the costs of shifting from conventional, monocrop, and mechanized farming to organic farming result in higher costs and/or declining productivity.

Extreme weather conditions caused by global warming increase farming risks and can greatly reduce farm productivity. The implications of climate change for food security are currently widely discussed at the policy level. Farmers and the agriculture sector have, in the interim, been left to face the risks and impacts of extreme weather conditions with relatively little assistance from the public and private sectors or from international organizations. Smallholder farmers are the most vulnerable of all. Their livelihoods are the most susceptible to frequent and severe losses in farm production due to extreme weather conditions.

Under current conditions, it is anticipated that the average productivity of smallholder farmers in Thailand will decline. To maintain and, if possible, increase productivity, it will be necessary to modify current farming systems and farming techniques to minimize the impact of extreme weather. These changes must begin with seed selection, land preparation, watering systems, planting techniques, harvesting, and farm maintenance. The majority of smallholder farmers are not in a position to develop new farming approaches. Assistance from the private and public sectors and international organizations is therefore urgently needed.

Innovations and good practices

Enhancing GAP and productivity through innovative approaches

Under normal weather conditions, high and steady income flows can be realized by smallholder farmers if they can sell their produce at a fair price at harvest in any season of the year. Direct market access is one prerequisite for obtaining a better price. Minimizing logistics cost per unit is also necessary to increase their net income. A well-designed contract farming model is one of the solutions for generating high income streams for smallholder farmers in developing countries.

The Swift Company model was designed in 1989 and has been fine-tuned to meet local conditions and specific requirements in different parts of Thailand. The principle objectives of the model are to

- secure sufficient quantities of premium quality fresh produce that meet the highest standards of food safety directly from contracted farms on a daily basis; and
- ensure that every party in the chain, from grower to consumer, benefits fairly from the operation in a win–win model.

The model was designed to remove all the aforementioned major constraints faced by smallholder farmers.

The Swift Company model for GAP adoption with fair pricing

Following a comprehensive risk assessment of farm plots, smallholder farmers are organized into groups under the company's "contracted farming" model. Production planning at farms is done by the groups in collaboration with the company to supply a predetermined daily volume of fresh farm produce. At least one collection station is set up in the group to collect harvested produce on a daily basis from contract growers. The collection station is set up in the farming area of the group as a mechanism for literally moving the physical market within easy reach of the farmer. A critical mass to minimize logistics costs in moving fresh farm produce to the company's packing house is achieved through farm production planning and the setting up of collection stations.

Members of the group have direct access to markets and can sell all grades of their farm produce at guaranteed prices agreed upon prior to planting. Under the terms and conditions of the contract, if the market price at any time is higher than the guaranteed base price, the market price is applied. Produce is transparently weighed and graded by company staff in the presence of growers.

Fair pricing is determined by giving due consideration to the costs of farming and retail price in any targeted market. Through a back calculation, average gross margins of retailer and importer, and logistics costs incurred in moving produce from the company's packing house to the market, are deducted from the retail price. The produce will not be sold when the gross margin of farmers is lower than a predetermined level after the company's processing and overhead costs and local inland logistics costs have been taken into consideration. In situations where the margin is acceptable and/or farm produce has good long-term market potential,

the buying price at the farm gate is set through an open discussion between the company and group members. The price is guaranteed in writing in the contract and is open for revision on an annual basis by both parties.

The company's well-planned financial assistance programs ease financial constraints. These include granting long-term interest-free loans to the group rather than to individual farmers. In cases where members have done their best in farm maintenance but incur severe damage or total losses in farm production because of uncontrollable factors, each individual farmer is provided with a grant, with no strings attached, to finance a new round of farming.

Technological and market information constraints are removed through the provision of intensive training at no cost and through monthly meetings and discussions with members of the company.

Swift Company's model with built-in fair pricing has been working well. GLOBALG.A.P. was introduced to contracted grower groups of smallholder farmers in late 2000. The practice was certified in Option 2, i.e., group certification, in early 2003. Currently, all members of the company's grower groups practice GLOBALG.A.P. in their conventional farming operations. Chemical-free farming based on GLOBALG.A.P. practices was introduced in 2005 to all asparagus-contracted growers of the company.

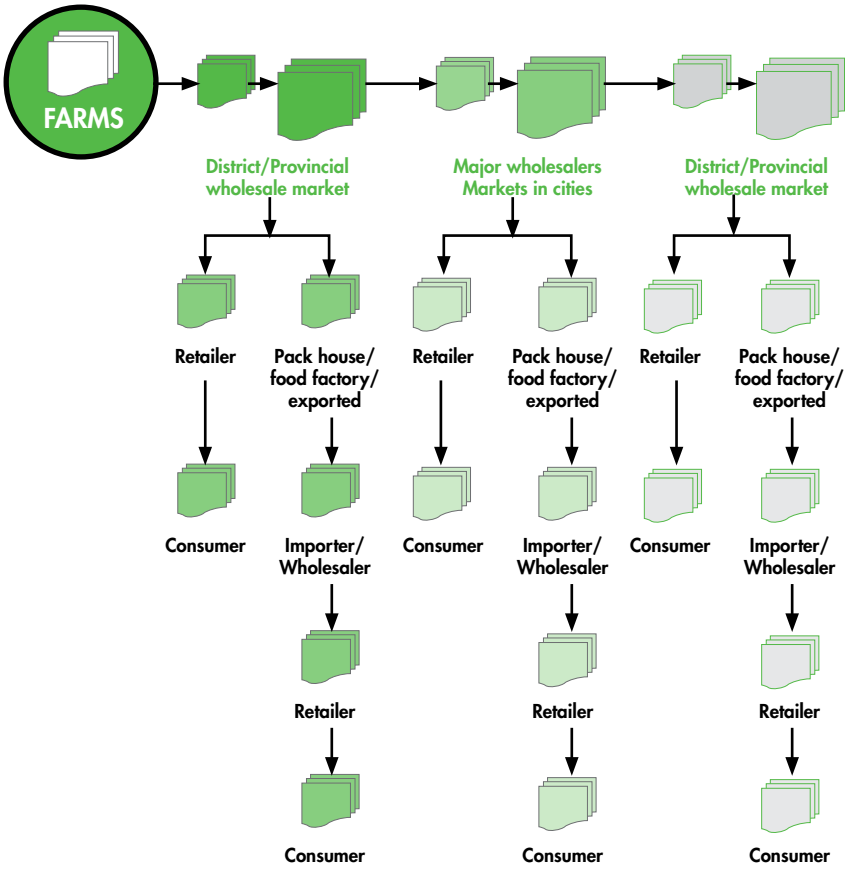
Organic farming was introduced to new groups under the same contract farming model in 2001. Group members then had no experience in either organic farming or green asparagus production. Through intensive training and the commitment of two small core groups, the organic asparagus farms were certified in 2003. The success of the two groups, in term of streams of high income and good farm yield, led to rapid expansion in area. The high and steady flows of income of the core groups made it relatively easy to convince new members to switch to organic farming.

Lessons from the Swift model for GAP adoption

A well-designed contract farming model, together with its successful implementation, is only one key factor for success. Long-term sustainability of the model cannot be achieved if produce from the small farms is not efficiently linked to markets at competitive prices. A comprehensive larger model is required to sustain the operation. A new value chain and a new approach to managing quality in the chain must be developed.

The traditional multitier supply chain model is currently the prevailing model for fresh produce in Thailand, whereby fresh produce changes hands many times between the farm and major wholesale markets and consumers (Figure 1). Poor logistics, poor handling, and lack of postharvest management result in considerable wastage in the supply chain. Produce safety and quality are compromised. Value losses are pushed back to farmers and passed on to consumers, resulting in a relatively very low price even as consumers pay much more for poor quality

Figure 1: Prevailing supply chain



produce that is also unsafe. No one benefits from the prevailing supply chain. Everyone loses—including entrepreneurs/traders, wholesalers, retailers, growers, and consumers.

Swift Company developed a new supply chain model, which undertakes the daily delivery direct from smallholder farmers of the contracted groups, organized under the company's contract farming model (Figure 2). Postharvest control and traceability systems can be applied immediately after harvest at each collection station. The daily harvest of each individual smallholder farmer is combined into a large enough volume that is consolidated and transported to the company's packing house by refrigerated truck. Logistic costs are minimized through farm production planning and the establishment of collection stations. Quality and

food safety management and maintenance, which start on the farm, are maintained throughout the supply chain. Wastage in the chain approaches zero as a result of improvements in quality management in the chain.

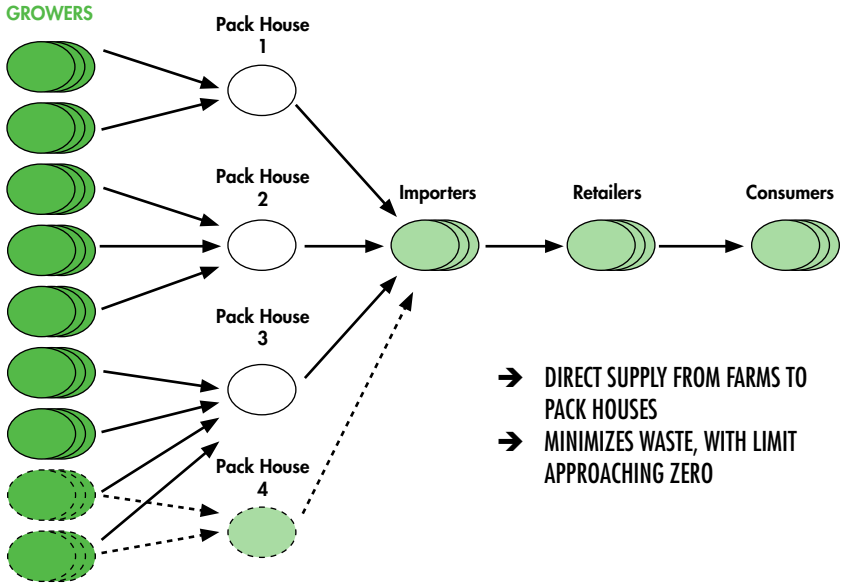
Swift Company is able to pay a much higher price for farm produce by managing waste and eliminating tiers in the supply chain that incur additional expenses and traders' profit. Incomes of contracted farmers are significantly increased not only from the higher price at the farm gate, but from either reduced farming costs or better yields, or both. The guaranteed buying price in the contract automatically transfers gains realized through cost reduction and/or improved yields to farmers. The contract farming model and development of the company's supply chain clearly show that higher prices at the farm do not always result in higher prices to consumers.

Operations at the packing house include freezing, dehydration, and semiprocessing to ensure the full use of different grades of fresh produce. Currently, high-quality fresh, frozen, and processed products that conform to food safety standards are delivered at competitive prices on a regular basis to high-end retail chains in Thailand and many export markets such as Australia, Europe, Japan, Republic of Korea, New Zealand, Switzerland, and United States.

Increasing productivity outputs through innovative farming approaches

Food security is a pressing issue, given limited farm lands and the growing world population, which is expected to reach 9 billion by 2050. Increasing productivity

Figure 2: Swift Company's supply chain



outputs is one of the key responses to reducing shortages in the world food supply if farm outputs can be efficiently linked to markets.

Innovative farming approaches can play a significant role in increasing productivity outputs, as in the case of sugarcane farming under contract with the U-Thong Industry Factory and vegetable farming organized by Swift Company in Thailand.

Innovative sugarcane farming at the U-Thong Sugar Industry Factory. The factory, a private enterprise, introduced a new sugarcane farming technique in 2009, with a targeted output of 100 metric tons per rai or 620 metric tons per hectare (6.2 rai = 1 ha). Sugarcane was planted in tight rows, with 1,600 cane plants per row of 40 meters by 1 meter (one rai consists of 40 rows, with 248 rows per ha).

In preparing the farm land, 500 kilograms of composted bagasse was mixed with the soil. Fertilizers, based on composted bagasse, were applied on two occasions during the growing period; the first application was made at 2 months after planting and the second after 4.5 months. The sugarcane plants were watered for 20 minutes every 2 days with a minisprinkler system. A wooden frame was used to support the cane to prevent it from collapsing. Lower leaves of the cane were removed within 3–4 months after planting. In April 2010, 85.06 metric tons were harvested against the target of 100 metric tons. The shortfall was due to damage caused by a summer storm and late harvesting.

It is anticipated that the success of this innovative approach will revolutionize sugarcane farming in Thailand.

New approaches in vegetable and asparagus farming by Swift Company. On pilot farms in several provinces of Thailand, the company is experimenting with a new approach for land and soil preparation, watering, and plant protection to lessen the negative impact of extreme weather conditions. This approach seeks to maintain farm outputs during the rainy season at the same level as those of the peak season. Planting beds are elevated to 50 centimeters (cm) above ground level with adequate drainage on both sides. The beds are narrow to facilitate rapid drainage of excess rainwater during heavy and continuous rainfall. Water retained by air pockets in the soil is rapidly drained within a short time after rain. On average, 20 cm of topsoil is prepared to allow the optimal functioning of fibrous roots under all weather conditions.

A new watering method designed to minimize water usage in the field has also been introduced to replace overhead sprinklers. The asparagus plants and other vegetables are watered only when the moisture content of the soil is below a predetermined level. When necessary, the plants are roped to bamboo poles to protect them from damage by strong winds. It is surmised that the cause of severe damage to the plants in Thailand in 2010 was the high temperature (around 40°C) during the dry season as well as excessive ultraviolet (UV) radiation. Swift Company plans to conduct a study on the impact of excessive UV radiation on

U-Thong sugarcane innovations: Dense planting of sugarcane, with short variety of grass paved between rows to prevent weeds (left). Tall sugarcane with bamboo support to prevent collapsing in strong wind (right).

asparagus plants and leafy vegetables and how to protect them from its harmful rays. A scientific study has been put on hold at present because of resource limitations.

Although the initial results have been quite encouraging, it will take at least 2–3 years to reach firm conclusions on the new approach. These innovations in production offer the potential to increase annual farm outputs by more than twofold even under extreme weather conditions.

Action areas

In conclusion, sustainability of GAP can be achieved only when smallholder farmers realize high and steady streams of income from the implementation of these practices. Proven farming technologies that can increase productivity must be introduced to the farmers after taking local conditions into consideration. Training and capacity building must be made available to smallholders at minimum cost or no cost to them.

Increased farm productivity and innovations in farming hold much potential for increasing farm outputs for the world population by 2050. But the demand–supply gap will be narrowed only if farm products can be efficiently linked to markets at fair prices. Wastage in the supply chain, in processing, and in consumption must be greatly reduced on a global basis.

Role of international organizations and the public sector

1. Sufficient support must be provided by international organizations and the public sector to
   - advance basic and applied research on innovative farming, from seed development to postharvest control and handling;
   - encourage the private sector, particularly small and medium enterprises, to develop and apply innovative farming approaches; and
   - develop strong cooperation between the public and private sectors in agricultural development planning and implementation. The private sector

should be treated as an equal partner rather than being perceived as a party that would exploit funding for its own benefit. Mutually beneficial cooperation that will generate sustainable socioeconomic results in agricultural development projects can be established between the parties, given good planning and transparent implementation.

2. Agricultural development planning and funding must place specific focus on sustainability. This will be realized only when farm products can be effectively linked to markets and generate high and steady income for farmers.
3. Wasteful funding that results in the collapse of project interventions following project termination must be stopped.
4. Accountability systems must be established from project planning to implementation and subsequently to monitor sustainability of a project.
5. Workable guidelines with built-in incentives and that make use of a "carrot and stick" approach should be designed by the public sector to stimulate private sector interest in contributing to agricultural development programs.

Role of the private sector

1. The private sector must revise its normal business practice from its exclusive focus on short-term gains or profits to looking at *both* short- and long-term gains.
2. The private sector should broaden its perspective and act transparently as an "agent of change" in introducing and transferring proven farming technologies that increase the productivity of its suppliers.
3. The private sector must assist its suppliers in reducing wastage in supply chains.
4. To improve productivity in smallholder farming, private enterprises must act responsibly and refrain from exploiting entities that do not have any bargaining power in commercial transactions.
5. The private sector must advocate the application of GAP and environmental protection, thus balancing monetary gain and profit with responsible acts.

Spurring rice productivity in Asia

A global rice science partnership

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Rice is life for Asia, and an agricultural research and education center shows how science is the source of innovation to do what was said could not be done.

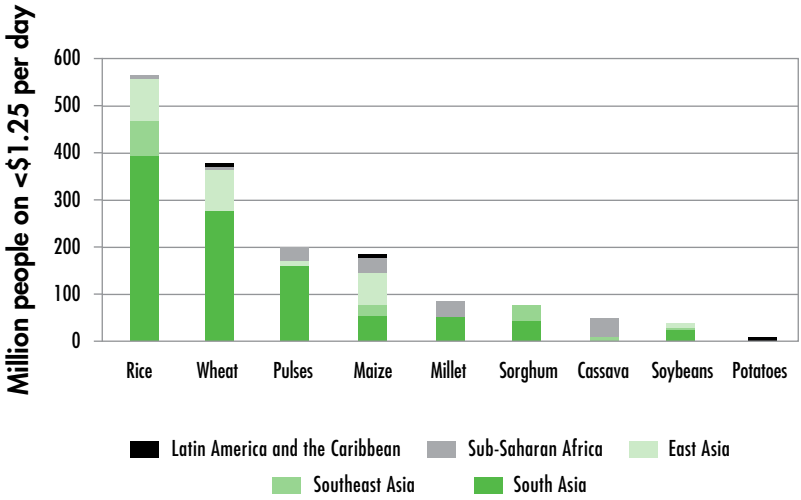
Rice is the most important food crop of the developing world and the staple food of more than half of the world's population, many of whom are also extremely vulnerable to high rice prices. In developing countries alone, more than 3.3 billion people depend on rice for more than 20% of their calories. One-fifth of the world's population, more than 1 billion people, depends on rice cultivation for livelihoods.

Harvested from 160 million hectares (ha) annually, rice has twice the value of production in the developing world of any other food crop: more than $150 billion per year. Nearly 560 million people living on less than $1.25 (purchasing power parity [PPP]) per day are in rice-producing areas, far more than for any other crop (Figure 1).

Asia, where about 90% of rice is grown, has more than 200 million rice farms, most of which are smaller than 1 ha. Rice is the staple food for most of the poor in Asia, where poverty remains staggering, particularly in South Asia (Figure 1). For the extreme poor who must live on less than $1.25/day, rice accounts for nearly half of their food expenditures, and a fifth of total household expenditures, on average. This group alone annually spends the equivalent of $62 billion (PPP) for rice.

Over most of developing Asia, rice availability is equated with food security and closely connected to political stability. Changes in rice availability, and hence price, have caused social unrest in several countries, most recently during the food crisis of 2008. The World Bank estimated that an additional 100 million people were pushed into poverty as a result of that crisis.

Figure 1: Number of people who live below the $1.25 per day (purchasing power parity) poverty line in areas dominated by different crops (2005 data)



Note: Numbers are based on areas more than 10% covered by the dominant crop.

Rice production systems are unique, and the longevity of rice farming speaks for itself. Irrigated lowland rice, which makes up three-quarters of the world rice supply, is the only crop that can be grown continuously without the need for rotation and can produce up to three harvests a year—literally for centuries, on the same plot of land. Farmers also grow rice in rainfed lowlands, uplands, mangroves, and deepwater areas. In Asia, rice is grown almost exclusively by smallholders (<2 ha).

Rice remains productive in environments where most other crops would fail. In irrigated and rainfed lowland systems, rice is grown in anaerobic (flooded) soil, which is disturbed after each crop; fields are periodically submerged and the soil is softened. The aquatic phase reduces soil acidity, improves nutrient availability, and promotes biological nitrogen fixation; it brings with it a host of arthropods, snails, frogs, and other beneficial fauna and flora in cycles that had their origins millennia ago. Fish and ducks can be raised in the fields. Apart from these provisioning ecosystem services are also regulatory services—flood buffering and trapping of sediments and nutrients, and moderation of air temperature; supporting services—irrigated fields are "human-made wetlands" that support a rich biodiversity; and cultural services—many ancient communities were founded around rice irrigation areas, where rice remains an important cultural icon.

Whichever way rice is viewed—quantity, productivity, value of production, number of farmers, number of consumers, affordability to the poor, or dietary importance—it will remain the dominant feature of the nutritional and agricultural

landscape of many developed and developing countries far into the foreseeable future.

The importance of rice to the overall sense of well-being for most rice consumers cannot be ignored. The phrase "rice is life" is not to be taken lightly, because the grain figures in many creation beliefs across Asia and is deeply embedded in social practices and customs. Thus, rice shortages affect society far beyond the cold statistics that price, caloric intake, yield growth rates, and international trade suggest. Any significant disruptions of rice supplies can and do have far-reaching social and political ramifications.

Issues and challenges

A variety of factors, from falling yield growth to climate change, threaten future rice production.

Declining yields and less land, water, and labor availability. Yield growth has fallen, partly as a result of the decline in investment in productivity research since the early 1990s, from 2.2% during 1970–1990 to less than 0.8% in the 1990s and 2000s. The area under rice production in major producing countries has been decreasing, owing to the conversion of land for other purposes. Fewer hands are available for farming, as young people prefer to look for jobs outside the agriculture sector. Although there is still scope for expanding the area under rice cultivation, conservation of natural ecosystems must remain a high priority. Increasing rice yields on existing land must remain the primary strategy for increasing production.

Irrigated rice provides 75% of the world's rice production, which is typically grown in puddled transplanted fields with continuous ponding. However, water for agriculture is becoming increasingly scarce. The causes are diverse and location specific, but they include decreasing physical availability (e.g., falling groundwater tables, silting of reservoirs), decreasing quality (e.g., chemical pollution, salinization), malfunctioning irrigation systems, and increased competition from other sectors such as urban and industrial users. By 2025, an estimated 15–20 million ha of irrigated rice will suffer some degree of water scarcity. Labor for the huge task of transplanting rice is also becoming increasingly scarce because of migration to urban areas and overseas. In 2007, the Government of India introduced the National Rural Employment Guarantee Act, which promises 100 days of paid work per financial year in people's home villages, creating serious labor scarcity in the cereal food bowl of northwestern India, which is dependent on millions of migrant laborers.

Effects of economic growth. Rapid economic growth in large countries such as People's Republic of China and India has increased demand for cereals, both for human consumption and for livestock production, which has pushed up the price of cereals in general. Economic growth is often accompanied by diversification of food demand, which creates opportunities for diversification of rice-based systems

to include higher value crops and livestock, but also reduces the amount of land available for rice. The rice-related tensions that developing countries face are growing more complex as their economies grow: between poor rice farmers and poor consumers, between small-scale and large-scale rice-based farms, between rice and more lucrative cash crops, between edible crops and biofuels, between crops and other land uses, and between crops and other water uses.

Pressure on land use. As a consequence of economic growth, current rice cultivation areas are likely to be lost to urban expansion, land conversion to biofuels, and diversification into other agricultural products. This all means that sufficient production to meet growing future demand will have to come from smaller and smaller areas, particularly if diversification is to be possible while keeping rice prices affordable to poor consumers. In turn, this adds urgency to the need to improve productivity.

Water scarcity. By 2025, 15–20 million ha of irrigated rice will suffer some degree of water scarcity, which results from competing water uses and climate change and requires rethinking of current management paradigms. In northwestern India, declining groundwater levels pose a serious threat to one of the world's most important grain baskets. In fact, rice systems draw much of their ecological resilience from intensive water use, and new solutions need to be found for water-scarce conditions.

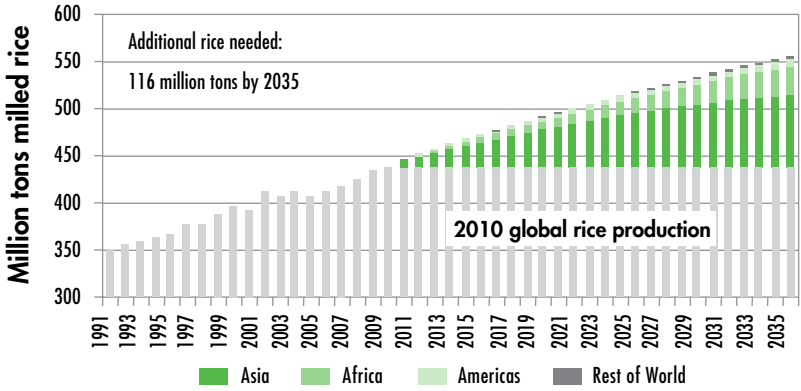
Climate change. Global climate change has potentially grave consequences for rice production and, consequently, for global food security. Land-use systems in most developing countries are highly vulnerable to climate change and have little capacity to cope with its impacts. Conditions for rice farming will deteriorate in many areas through water shortages, low water quality, thermal stress, sea-level rise, floods, and more intense tropical cyclones. A study by the International Food Policy Research Institute forecasts, by 2050, a 15% decrease in irrigated rice yields in developing countries and a 12% increase in the price of rice as a result of climate change. Moreover, flooded, intensively managed rice systems release large amounts of methane but also sequester carbon in soil organic matter, whereas more diversified rice-based cropping systems release less methane but more nitrous oxide and carbon dioxide.

Most disconcerting is that more than half of the growth in Asian rice production over the past decades came from the "delta countries" such as Bangladesh and Viet Nam—precisely the countries most vulnerable to sea-level rise and climatic extremes. Many unique ecosystem services in wetland rice culture are now under threat from increasing water scarcity, further aggravated by climate change. What will change in these systems if farmers diversify cropping or switch to "aerobic" water management? Will these systems be resilient and productive enough over the longer term? What will be the sustainable rice-based cropping systems and crop management practices of the future?

Global and regional rice demand growth and challenges. Global rice consumption remains strong, driven by both population and economic growth

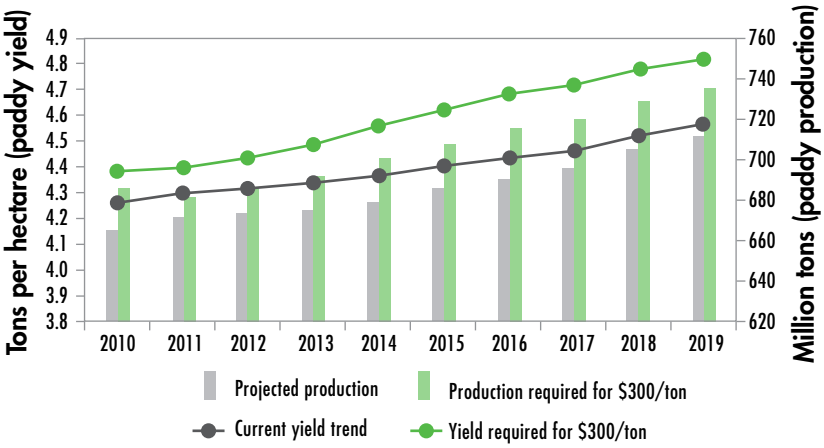
in many Asian and African countries. Based on population projections from the United Nations and income projections from the Food and Agricultural Policy Research Institute, global rice demand is expected to rise from 439 million tons (milled rice) in 2010 to 496 million tons in 2020 and to further increase to 555 million tons in 2035 (Figure 2). This is an overall increase of 26% in the next 25 years, but the rate of growth will decline from 13% for the first 10 years to 12% in the following 15 years as population growth drops and people diversify from rice to other foods. Among the various rice-consuming regions, Asian rice consumption is projected to account for 67% of the total increase, rising from 388 million tons in 2010 to 465 million tons in 2035. In addition, 30 million tons more rice will be needed by Africa, an increase of 130% from 2010 rice consumption. In the Americas, total rice consumption is projected to rise by 33% over the next 25 years.

Figure 2: Global rice production increases needed to meet demand by 2035



With further area expansion unlikely in Asia, rice yields from smallholders must rise much faster than in the recent past if world market prices are to be stabilized at affordable levels for the billions of consumers (Figure 3). Globally, farmers need to produce at least 8–10 million tons more rice rice each year—an annual increase of 1.2%–1.5% over the coming decade, equivalent to an average yield increase of 0.6 tons per ha during the next decade. Over the longer run, growth in global rice consumption is expected to slow down, but yields will have to continue to grow faster than at present because of pressure on rice lands in the developing world from urbanization, climate change, and competition from high-value agriculture. Rice yield growth of 1.0%–1.2% annually beyond 2020 will be needed to feed the still growing world and keep prices affordable. At the same time, incomes for smallholder rice farmers must rise significantly if the best and brightest are to remain in the farms and their quality of life is to improve.

Figure 3: What the world needs to keep rice prices affordable at around $300 per ton



Note: Grey columns and lines—current rice production and yield growth rates, respectively; green columns and lines—yield and production growth required to stabilize rice prices at $300 per ton). Simulation was done using the Arkansas global rice model.

Constraints to increasing rice production are largely of a nature that spans borders. Hence, a regionwide effort to increase rice production will require not only new tools; it must also change the practices and mindsets of millions of farmers to accept the challenges in their fields. While commonalities underpin a regional program, needs, opportunities, and priorities differ across regions. However, the adoption of rice technologies and approaches may be stalled if the policy environment is unfavorable. Harmonized and enabling rice-related legislation regionwide will be essential if farmers and other rice-sector stakeholders are to take advantage of new and improved production systems adapted to climate change.

Finally, knowledge of such production systems must reach the many, especially poor small producers. This will require increased numbers of knowledgeable extension personnel and information sources to keep them informed. Since women play large and crucial but often unrecognized roles across the sector, extra efforts are needed to ensure they have the same opportunities as men to access new technologies.

Innovations and good practices

Our thesis is that innovations to benefit smallholders and that address the significant challenges facing rice growers and countries that depend on rice will require solid research and political underpinnings. Scientific advances in genomics and marker-assisted breeding mean that gene bank materials can be explored on a

large scale to identify and embed the genes responsible for ever more complicated target traits. Transgenic technologies offer the potential to engineer new plants that were previously unthinkable, such as rice using a new photosynthetic pathway. Meanwhile, improvements in sensors, processing, communications, and possibly nanotechnology offer the potential to revolutionize how field experiments are conducted and can enable a precision-agriculture revolution in input-use efficiencies.

New information and communication technologies have made the time ripe for maximum exploitation of the economies of scale possible in rice research. We present three areas where major investments are required and that can have major impacts on the well-being of small rice holders: (1) stress-tolerant rice varieties adapted to neglected areas, (2) improved water management approaches that can stabilize productivity, and (3) approaches to capture greater and significant value for smallholders.

Stress-tolerant rice varieties. Flooding, drought, and salinity are major problem for farmers across Asia, and each of these is expected to increase in severity and frequency in the coming decades with the changing climate. Submergence- or flood-tolerant rice is the furthest along in its development and serves as an excellent example of innovations that can directly benefit the poorest and smallest rice farmers. It is also an excellent practical example of how research in partnership with a range of local, state, and national government agencies can come together to accelerate the impact of new and effective technologies.

Although rice is usually grown in standing water, as for most plants, prolonged complete submergence is disastrous. In Bangladesh and India alone, farmers suffer annual crop losses because of flooding of up to 4 million tons of rice—enough to feed 30 million people. Over the past decade, IRRI researchers and colleagues from the University of California isolated the Sub1 gene—which confers tolerance of submergence for up to 2 weeks—from a traditional, low-yielding, flood-tolerant Indian variety. IRRI scientists used a method known as marker-assisted selection (this technique is not transgenic and thus not subject to the regulations and testing that delay the introduction of genetically modified crops) to develop flood-tolerant versions of existing popular rice varieties.

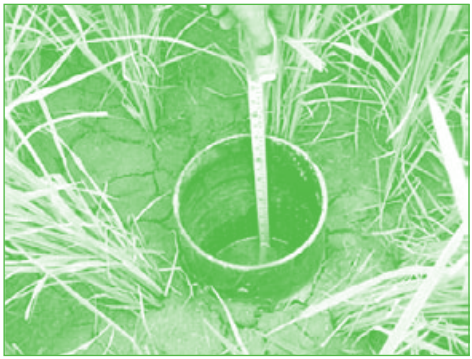
Planted in flood-prone areas, these varieties can handle more than a week's submergence with almost no loss of yield (1 week is enough to severely curtail the harvest of the nontolerant versions) and recover to produce a reasonable yield after even 2 weeks of submergence (which will almost wipe out the nontolerant versions). Under good conditions, the yields of the Sub1 and "normal" versions are almost identical, and there is no need for farmers to learn new crop management techniques. In collaboration with national rice research systems, a suite of these so-called Sub1 varieties have been or are soon to be released for cultivation in farmers' fields. In 2009, over 600 tons of seed were produced and distributed to more than 50,000 farmers in Bangladesh, India, and Nepal.

Similar results have been obtained for salt-tolerant and drought-tolerant varieties in South Asia. In 2009, the Indian Ministry of Agriculture, through the national and state seed corporations and the National Food Security Mission, produced and distributed more than 110,000 "minikits"—5-kilogram packets of stress-tolerant rice seed—and it plans to distribute over 200,000 minikits in the first half of 2010. It is expected that these new varieties will cover more than 10 million ha of rice in only a few years, bringing the Green Revolution to millions of farmers who until now have been left behind.

Improved water management. The imperative for research and development (R&D) of technologies to address water scarcity is greater than ever. There is no single technology to respond to the wide range of water-scarcity scenarios and the environments in which they occur, and future research efforts will need to focus on the development of a "basket" of options. In the past 10 years, IRRI and partners have made much progress in the development of technologies that greatly reduce water input to rice, including safe alternate wetting and drying (AWD).

Lowland rice production involves flooding, puddling, and transplanting, and the fields are normally kept flooded until shortly before harvest, resulting in excessive losses in the forms of deep drainage, surface runoff, and evaporation. Irrigation water use in lowland rice can be reduced by 15%–40% by AWD instead of continuous flooding, while maintaining yields. However, if the soil in the root zone is allowed to dry too much (above about 10 kilopascals water tension, but still wetter than field capacity!) for extended periods, yields decline. Safe AWD involves flooding the field with a shallow depth of water, say 5 centimeters (cm), and then reirrigating a few days after the floodwater has dissipated. The question for farmers is "for how long is it safe to wait between irrigations?"

A compelling example of how years of water management research at the field level can be translated into a simple technology that any small rice farmer can use to implement safe AWD is found in Bangladesh. In 2002, IRRI and several partners began research into dissemination of safe AWD. Very simple water monitoring tools were developed to allow farmers to adopt this technology reliably and safely. IRRI scientists developed a simple perforated polyvinylchloride pipe that farmers can drive into the soil of their rice plots to monitor soil moisture. When the free water (water table) in the pipe falls 15–20 cm below the soil surface, farmers know it is time to irrigate their fields to avoid stressing the



IRRI's "magic pipe": Irrigate when water is 15–20 cm below the surface.

plants. These pipes are known as "panipipes" (*pani* is Bengali for water), but some farmers refer to them as "magic pipes." Syngenta has distributed over 50,000 of these simple field tools free of charge via their dealer networks, and is now commencing to promote the technology in India.

Tens of thousands farmers in Bangladesh, more than 60,000 in the Philippines, and thousands in Viet Nam have since adopted safe AWD. For Bangladeshi adopters, reduction in irrigation water use of 15%–30% means reduced pumping costs and fuel consumption, and increased income of $67–$97 per ha. IRRI's Irrigated Rice Research Consortium received requests from Indonesia, Lao People's Democratic Republic, Myanmar, and Thailand to help them disseminate the AWD concept, which will become more important in the face of the water scarcity that is predicted to affect 15–20 million ha of irrigated rice by 2025.

Capturing value for small rice farmers. Under normal weather conditions, high and steady flows of income can be realized by smallholder farmers if they are able to sell their products at a fair price and can easily deliver their daily harvest to market at a minimal logistics cost. A well-designed contract farming model and its successful implementation constitute one of the key success factors for generating income streams to smallholder farmers in the region.

Action areas

The overarching importance of smallholders in Asia will not change, even with the changing environmental, economic, demographic, and social landscape. Many large multinational and national companies are engaged in agricultural production along the whole value chain, from providing inputs to processing and marketing outputs.

The public sector must redefine its role in research and extension to focus on areas of comparative advantage and innovative public–private partnerships that will enable both sectors to more efficiently develop new technologies and information and deliver them to smallholders in a more efficient manner than is currently the case. Governments and investors should support this process through policies and investments that provide the necessary, sustained support for public sector R&D as well as public–private sector partnerships, and stimulate and enable private sector investments.

The research pipeline must be fortified to insure a steady supply of new technologies suitable for adoption by smallholder rice farmers. Increased investments are required by both the public and private sectors in the following thematic areas:

Harnessing genetic diversity to chart new productivity, quality, and health horizons. This research aims to uncover new traits in the rice genome—particularly traits related to water stress, because water is the main concern for future rice-cropping systems—and make them available to breeding programs worldwide.

Accelerating the development, delivery, and adoption of improved rice germplasm. The deeper understanding of rice's genetic diversity will allow international and regional breeding programs to speed up the development and delivery of improved and climate-resilient germplasm. The aim is to transform public-sector breeding programs to become better targeted to the demands of different stakeholders—farmers, consumers, processors, and the marketing sector.

Increasing the productivity, sustainability, and resilience of rice-based production systems. Advances in rice production and optimizing the environmental footprint of rice require integrated solutions for managing production systems.

Extracting more value from rice harvests through improved processing and market systems and new products. Research must find ways to increase harvest value and develop mechanisms to support and harmonize the activities of producers, processors, and marketers, while ensuring equitable benefits for poor farmers.

Fostering improved policies and technology targeting to enable improved rice production and marketing. A clear understanding is needed of the needs of farmers and other actors, particularly women, for any research agenda to be relevant. Likewise, timely and freely available information on expected yields and market conditions for key commodities is needed.

For these research streams to yield benefits for smallholders, it will be essential to develop strong cooperation between the public and private sectors for agricultural development planning and implementation. This must include support to the private sector, and particularly small- and medium-sized enterprises, for developing and applying innovative farming approaches. Finally, both the public and private sectors must target the poor and vulnerable through appropriate capacity-building and financing strategies to enable them to participate effectively in the market.

To that end, IRRI, in collaboration with over 900 R&D partners worldwide, will lead the new Global Rice Science Partnership (GRiSP), which for the first time ever provides a single strategic and work plan for global rice research and how it can contribute more effectively to solving development challenges at the regional, national, and local levels. The GRiSP provides new opportunities for partnerships in R&D, bringing together advanced research institutes and universities; national research, education, and extension systems; international and regional forums and development organizations; Consultative Group on International Agricultural Research centers; emerging strong national research systems; the private sector; and civil society organizations involved in grassroots work with male and female farmers.

Rice-based production systems and value chains will form the overarching organizing principle of the partnership. All research will use an interdisciplinary approach in which targeting and prioritization are based on a clear understanding of the different environments, management systems, and market segments targeted. This will need, on the one hand, a broad range of scientific or upstream partners to seek out innovations and, on the other hand, many partnerships at the

grassroots level for both dissemination and feedback. The result will be accelerated development of international public goods across the whole rice sector. The program components are structured into six major rice R&D themes:

Theme 1: Harnessing genetic diversity to chart new productivity, quality, and health horizons

Theme 2: Accelerating the development, delivery, and adoption of improved rice varieties

Theme 3: Ecological and sustainable management of rice-based production systems

Theme 4: Extracting more value from rice harvests through improved quality, processing, market systems, and new products

Theme 5: Technology evaluations, targeting, and policy options for enhanced impact

Theme 6: Supporting the growth of the global rice sector

Through targeted annual investments in GRiSP research of at least $100–120 million, expected impacts by 2035 include the following:

- Expenditures on rice by those below the $1.25 (PPP) poverty line will decline by PPP $11 billion annually (holding consumption constant). Counting those reductions as income gains means that 150 million people will be lifted above the $1.25 poverty line, reducing the global number of poor by 11%.
- As a result of increased availability and reduced prices, 62 million undernourished people can reach caloric sufficiency in Asia, reducing hunger in the region by 12%.
- Nearly 1 billion tons of carbon dioxide-equivalent emissions will be averted.

Blending the ancient and the new to provide solutions

Agricultural water management

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Across Asia, modern technology and management concepts are combining with methods old and tested to revitalize irrigation and raise productivity while conserving precious water resources.

Irrigated agriculture has been at the heart of rural growth in the Asia and Pacific region.[1] Most Asian countries became food self-sufficient in the 1970s and 1980s, thanks to the Green Revolution, which quickly pushed up productivity through irrigation, greater cropping intensities, high-yielding varieties, and fertilizers. This helped reduce poverty and boost rural growth. More than 700 million in the region still live on less than $1/day, and half of the population of Asia and the Pacific will still be rural in 2030. Farming will continue to provide livelihoods and food security for many people. Poverty reduction will remain a key objective of future developments in agricultural water management. Depending on the stage of development, agricultural growth, often supported by irrigation development, is often more effective at reducing poverty than growth in other sectors.

Demand for food and animal feed crops will double in the next 50 years to feed the extra 1.5 billion people who will live in the region by 2050. As there is very little scope for expanding arable land and also clear limits on the amount of additional water that can be used for agriculture, growing this extra food and animal feed will require better management of existing irrigated lands. Developing extensive new irrigation schemes is no solution. Future investments must protect the environmental services that wetlands, rivers, and other ecosystems provide. Investments to raise yields and productivity from irrigated land are thus key

[1] This paper is based largely on IWMI and FAO, *Revitalizing Asia's irrigation to sustainably meet tomorrow's food needs* (2009).

to producing the extra food needed, while safeguarding the environment from additional stresses. Other options, such as upgrading rainfed farming and increasing international trade in food grains must contribute, but they will need to be supplemented by a significant increase in production from irrigated agriculture.

The face of the region is changing fast. Wealthier city dwellers have new dietary demands that are providing farmers with opportunities. Irrigated agriculture still offers huge opportunities, but only innovative strategies will unlock potential gains. More strategically focused and diversified investment strategies will be needed to combine more equitable poverty reduction objectives and productivity gains.

Issues and challenges

Changing food demand requires shifts in agriculture and agricultural water management. Wealth influences dietary choices, and diets affect water use. Providing the foods that people now demand requires shifts in agriculture. Producing food for increasingly meat- or milk-based diets requires more water than for a vegetarian diet. Moreover, growing a range of crops requires a different irrigation regime from that needed to supply water to large areas planted with one or two cereals. The shift from rural to urban living has also provided farmers with more options. Some have chosen to quit farming for city-based jobs, whereas some have opted to become part-time farmers. Those remaining in the agriculture sector have taken advantage of improved access to markets to diversify their activities and produce the higher value niche crops that urban residents demand.

State-built irrigation schemes are underperforming, forcing farmers to invest on their own. The large-scale, centrally managed irrigation schemes of the past were not designed to be demand-driven or to provide the reliable, flexible, and equitable year-round water service that modern farming methods require. Beset with problems of inappropriate design, poor maintenance, salinity, and waterlogging, many large-scale schemes are currently in decline. Efforts by many national governments to rehabilitate them are ongoing, but results are at best mixed. With poor service provision and lack of effective management, farmers have taken irrigation into their own hands by pumping water from aquifers, rivers, and drains. Private groundwater now represents the bulk of irrigation in large parts of South Asia, East Asia, and Southeast Asia. Many farmers are investing in on-farm storage ponds to augment their supply and help them independently control their water supplies. Although this has resulted in substantial economic and productivity gains, this unregulated development has also frequently resulted in excessive pressure on resources.

Irrigation management transfer and participatory irrigation management have not lived up to expectations. Efforts to reform large-scale irrigation schemes by transferring management to farmers have had less than expected results in terms of improving (1) irrigated agricultural productivity; (2) services to farmers; or (3) the financial resource base for operation, maintenance, and continued upgrading

of the schemes. Although these reforms certainly often suffered from design and implementation flaws, many doubt the capacity of irrigation institutions to reform or to accept that the private sector could help improve water delivery. For example, irrigation departments could outsource irrigation services, create public–private partnerships, or provide incentives for irrigation officials to act as entrepreneurs in publicly managed operations. Such actions could help mobilize funds, increase efficiency, and improve provision of water services but are, as yet, rare and largely untested.

Investment in agricultural water management often remains excessively focused on irrigation, forsaking equity and productivity gains. Public investment patterns in agricultural water management remain very focused on formal irrigated agriculture. However, millions of poor farmers in the region depend on rainfed agriculture, which still plays a dominant role in producing the region's food supply. These farmers are the most susceptible to climate vulnerability and will be most affected by changes in rainfall patterns resulting from climate change.

Although the proportion of future food production that could or should come from rainfed or irrigated agriculture is a subject of debate, and there is no doubt that the region's food security hinges on improving irrigated water productivity, there are several compelling reasons to invest in water management in rainfed agriculture (Molden 2007). First, actual yields are low, and there is a large, untapped potential to increase productivity. Second, investment costs in rainfed areas tend to be lower than in irrigated agriculture. Third, irrigation development has high environmental and social costs. Upgrading rainfed areas through investments in soil and water conservation, water harvesting techniques, and supplemental irrigation can double or even quadruple productivity in drought-prone tropical regions. Clearly, these investments in improving rainfed productivity will also result in increased water consumption in the river basins.

Although water scarcity is a key issue, water conservation policies, strategies, and investments are still often based on a misunderstanding. As demand from all sectors grows, there will be increasing pressure on agricultural water use to become more "efficient." However, productivity and efficiency gains do not mean that more production will always be possible with less water. The common claim that increasing the "efficiency" of water use as a strategy to meet this growing demand, as well as for water conservation, can be misleading. An increase in efficiency frequently means that water consumption is increased because the service more precisely and uniformly matches water needs. This in turn tends to increase the value of water, and hence demand also increases. If taken in the wrong context, the quest for efficiency can lead to the wrong decisions being made economically, hydrologically, and environmentally.

Although irrigation losses and inefficiency appear high, with only about 40% of the water supplied to agriculture reaching plant roots, most of these losses return to the river basin in the form of return flow or aquifer recharge, and can be tapped by other users farther downstream or serve important environmental or other

functions. Therefore, conservation programs that target reduced water diversions or applications may end up saving no water; increasing water depletion; merely reallocating water, usually away from the poor and marginalized; or wasting vast amounts of money.

This is particularly true for canal lining programs, the introduction of improved or localized irrigation technologies such as drip irrigation systems, and attempts at managing agricultural water demand through water pricing. Similarly, programs aiming at improving the productivity of rainfed agriculture, and watershed management programs meant to conserve water (field leveling, soil water conservation, farm ponds, check dams, etc.) or protect the resource through reforestation, will probably increase agricultural production for upstream farmers but, by increasing water retention and depletion, reduce inflows downstream.

Innovations and good practices

Adapting irrigation design and operation concepts to changing objectives

Blending ancient and new technology: The Deduru Oya Project (Molden 2007). A new irrigation project in the Deduru Oya basin in Sri Lanka aims to capitalize on existing irrigation infrastructure while improving the reliability of supplies to farmers. Farmers living in the basins depend on rainwater that collects in 3,000 artificial lakes or tanks, but they frequently face water shortages. The tanks form part of a small and ancient irrigation system developed under the direction of King Mahasena between AD 277 and 304.

The Sri Lankan government has begun building a dam with the aim of capturing and storing the 1,600 million cubic meter (m^3) runoff generated by rainfall during the wet season. A 33-kilometer (km) canal will supply water to a 1.5-megawatt power plant as well as providing irrigation water to existing and new areas in the Deduru Oya and Mee Oya basins. A 44-km canal will supply the existing tank cascade system by connecting all the reservoirs, thereby ensuring that they are constantly replenished. Similar examples are to be found in the Tanbraparani basin in Tamil Nadu, India, where numerous tanks are supplied from a storage reservoir.

Recognizing and supporting farmers' initiatives

Water storage tanks: Improving canal irrigation in India and People's Republic of China (PRC) (Molden 2007). The Indira Gandhi Nehar Pariyojna (IGNP) scheme was set up to irrigate large areas of the Thar Desert, which covers two-thirds of Rajasthan, India. Under the *warabandi* system, water is allocated to canals on a weekly rotation, with each canal receiving water for a week and then drying out for a week. Although the system promotes equity, the timing of water supply is often mismatched for critical periods of crop growth. As the area irrigated by the IGNP expanded, the frequency of water supplies decreased.

Farmers acted to mitigate the unreliable water supply in the project area by building intermediate water storage tanks called *diggi*. An average diggi is about 900 square meters, with a storage capacity of 3,160 m^3. The farmers use sprinklers to distribute water from the diggi, with each sprinkler covering around 0.41 hectare (ha) of land. Farms now irrigate 27% more than before construction of the diggi. Benefits include an increase in the rental value of land and a doubling in the value of output from farms during the *kharif* (monsoon) season. The potential to improve the reliability and flexibility of water supplies through similar storage mechanisms in many large irrigation systems is substantial.

In the PRC, farmers in one of the major canal commands of the Zhanghe Irrigation System in Hubei were receiving declining water deliveries in recent decades, as dam supplies were being increasingly diverted to hydropower, cities, and industry. They responded by building small storage structures in their fields, which are recharged by return flows and runoff from within the irrigated area. Farmers can now maintain crop areas and water use despite receiving reduced water supply from the canal system.

Boosting water supply: Groundwater recharge movement in Saurashtra (Van Steenbergen and Shah 2003). The increasing scarcity of groundwater prompted a mass movement for groundwater recharge and water conservation in Saurahstra, Gujarat, India. The main catalyst was a religious teacher of the Swadhyaya Pariwar Hindu religious group, who was subsequently joined by other Hindu sects and scores of nongovernment organizations (NGOs). The campaign started in the mid–1980s in response to a severe drought, using the campaign slogan "The rain on your roof stays in your home; the rain on your field stays in your field; the rain in your village stays in your village." The movement caught popular attention and by 1995 had prompted many NGOs to examine the potential of recharging groundwater supplies.

In the early 2000s, the Gujarat State government launched a dam water-harvesting scheme, contributing 60% of the resources required to build the dam, with the community contributing the rest. In 2007, the Indian government launched a program for recharging wells. Although the mass movement for water harvesting in Saurashtra has not been rigorously assessed to include overall hydrological impact, studies show that these actions have locally reduced vulnerability by securing winter irrigation.

Innovations in institutional reform and management concepts

Incentivized management: Contracting out irrigation services and saving water in the PRC (Wang et al. 2007). The PRC's reforms in irrigation are based around creating profitable water businesses for long-term financial sustainability. A study of 51 villages located within four large irrigation schemes in the Yellow River basin indicates that the country has been largely successful with its "bounded service provider" model, which aims to create water-saving incentives for water managers.

Water managers from the local water users association or contract management arrangement receive a basic fee but can increase their incomes by saving water. The lower the village requirement for water, the more they earn. Studies from the Center for Chinese Agricultural Policy and IWMI found that water use per hectare is lower by as much as 40% in villages with incentivized management of large irrigation schemes. This saving does not significantly reduce yields of major crops, including rice and maize.

The PRC has also made significant achievements in saving water used for agriculture, thanks to institutional and technological innovations. Although the total volume of water being used by the country between 1980 and 2004 rose by 25%, that allocated to irrigation remained at 340–360 billion m^3, and yet the irrigated area increased by 5.4 million ha, food production capacity increased by 20 million tons, and 200 million people gained food security.

Service concepts in practice: The Jiamakou business model (Xuehui, Xiaodan, and Bin, forthcoming). The Jiamakou Yellow River Diversion Irrigation Project in Shanxi Province is the first large-scale high-lift irrigation system in the Yellow River basin. The area is semiarid, with very limited surface water and groundwater depth between 160 and 200 m. With the adoption of a market economy system, farmers started adjusting cropping patterns, shifting from cotton, wheat, and other cereal crops to fruit trees.

The development of management objectives and supporting management systems followed three distinct successive phases: (1) infrastructure upgrading, (2) management reform, and (3) integration of infrastructure upgrading and management reform. In the last phase, the system management has made a systematic effort to spell out its management philosophy and develop a business model based on a clear management vision that the system's success depends on (1) farmers meeting their economic objectives; (2) staff empowerment and incentives for performance; and (3) system integration of water ordering and delivery, financial transactions, and system operations (i.e., water, money, and information flows) in line with service-oriented management concepts.

The business model is based on breaking down management into business units that trade water and services with each other, with separate budgets and performance targets. Pumping stations, main canals, branch canals, and tertiary canals directly participating in water transactions are treated as autonomous business entities, and farm households are consumers of water. A buyer–seller relationship is built among them, with the supply determined by the demand (irrigation on request). The administration bureau controls the water price, and the water business entities have no right to change it. A "water ticket" issued by the administration bureau, instead of currency, is used among the water business entities, and the purchase of a water ticket constitutes a water supply contract in the irrigated area.

The economic, social, and environmental benefits of the project are remarkable. The net irrigation benefit is increased rapidly, reaching over CNY700

million in 2007. In the same year, the added value of irrigation water reached more than CNY15/m^3, mainly because of crop yield improvement, cropping pattern change, and improved efficiency, whereas the per capita income of farmers in the irrigated area was CNY7,498 or 2.21 times the average in Yuncheng City. The irrigation water inflow improved soil structure and nutrients and greatly reduced groundwater withdrawals. The granting of special status and large autonomy has allowed management to develop and implement its own management model and, specifically, to develop human resources management and staff incentive structures that are critical to the system's performance. The system is closely monitored and analyzed by progressive provincial and national authorities, who plan to disseminate this management model in the province and the country.

Expanding capacity and knowledge

Conserving groundwater: The water schools of Andhra Pradesh. Groundwater resources play a critical role in poverty reduction in India, supporting more than 60% of the irrigation water requirement in the country. However, the current patterns of groundwater use are coming to an end as an increasing number of aquifers reach unsustainable levels of exploitation. The Andhra Pradesh Farmers Groundwater Management System is a community-based project that focuses on developing the capacity of groundwater users to manage their resource in a common, sustainable way.

The project is the first global example of successful large-scale, community-based groundwater demand management. It educates farmers that groundwater conservation through collective decisions ultimately safeguards their own interest. Through Farmer Water Schools (FWSs), farmers learn different cultivation techniques to get higher returns from agriculture and participatory hydrological monitoring of the groundwater resource.

The FWS has made organizers, planners, and advocates out of farmers. The project has trained 1,700 farmer facilitators, 33% of whom are women; the total outreach of the program is estimated at a million farmers. About 42% of the hydrological units have consistently reduced the winter season draft over the 3 years of project operation, whereas 51% have reduced the draft intermittently. This impact is unprecedented in terms of both reductions actually being realized in groundwater draft and its geographic extent, covering dozens of aquifers and hundreds of communities. The approach is being considered for adoption by other states.

The project shows that it is possible, with the right approach, to reconcile rural development and poverty reduction with resource sustainability. Education and community building are crucial to the success of a project and should be funded accordingly. Managers must accept that farmers will almost always act in their own self-interest. Programs that build on this will be more successful than those that try to force farmers to behave in a way that will adversely affect their incomes.

Bridging the gap between research and extension: The "magic pipe."[2] A useful technique was developed by the International Rice Research Institute to advise farmers on when to irrigate their fields while avoiding yield losses due to water stress when they apply alternate wet and dry (AWD) field-level irrigation techniques. The innovation is a perforated polyvinylchloride pipe—the "magic pipe"—which can also be made of bamboo, to help farmers monitor water level, and a simple instruction: irrigate when the water level is below 10 centimeters deep. In the Philippines, 5,000 people have been trained in the technique, which has been disseminated to 60,000–70,000 farmers in the country. This success has generated policy support with an administrative order on the adoption of AWD techniques in irrigated rice production systems. The technique has also been adopted in Bangladesh, receiving wide publicity in the local media.

Retraining to modernize irrigation: MASSCOTE (Renault, Facon, and Wahaj 2007). The Food and Agriculture Organization has initiated a program to train engineers and managers on how to modernize irrigation systems. A methodological framework called MASSCOTE—Mapping System and Services for Canal Operation Techniques—introduces new tools for service-oriented management to make irrigation schemes function better at the system, state, and regional levels.

MASSCOTE was introduced in Karnataka, India in 2006. Staff members have shifted their focus from being supply oriented to being service oriented, improving the way in which they target investment planning and revising the ineffective Participatory Irrigation Management model to develop large farmer-owned organizations.

MASSCOTE has also been introduced in projects and training curricula in PRC, Nepal, Thailand, and Viet Nam. New versions are being developed to manage the multiple uses and roles of water, to integrate fisheries and aquatic resources into system management, and for pressurized systems.

Decreasing the vulnerability of the poor and vulnerable

Tube wells and farmer field schools: Technology transfer in the Philippines. Although the Philippines produces 85% of the rice consumed in the country, the volume of import requirements makes it the largest rice importer in the world. Impacts of rice price increases due to natural disasters are devastating for the urban and rural poor, especially for rainfed farmers. The poorest cannot invest in technologies such as shallow tube wells for lack of credit instruments adapted to their circumstances. Funded by the European Union, the Rainfed Agriculture Improvement Project has devised an innovative strategy to overcome this constraint.

The project, which has just started, will work with farmers outside the national irrigation system. Participants will be selected based on social criteria. The project

[2] To Phuc Tuong, personal communication, International Rice Research Institute.

will focus on the integrated application of the Small-Scale Irrigation System (SSIS), using a technology mix of shallow tube wells and surface water pumps to provide irrigation water for rainfed agricultural areas.

Farmer field schools (FFSs) will be the key platform to develop farmers' site-specific skills in agricultural production, deliver services to target farmers, and assist the government to mainstream SSIS-FFS within the Department of Agriculture and local government units. Only SSIS-FFS graduates who have completed the FFS curriculum will become eligible to receive SSIS. After making an up-front payment of 10%, which may be waived for the poorest, the parties will enter into a contract for a "Rent to Own Scheme" with the Philippine Rice Research Institute (PhilRice) for the use of SSIS. Farmers will be given a choice to own the equipment when they complete the payment of total equity. The project will develop a special SSIS Fund within PhilRice to receive repayments from farmers. This fund will be used for the expansion of SSIS into other rainfed areas.

Developing sound integrated water conservation strategies

Water accounting concepts: Integrating water conservation strategies in the PRC.[3] The World Bank Water Conservation Project has been implemented by the PRC's Ministry of Water Resources (MWR) in Beijing, Hebei, Qingdao, and Shenyang, which are areas characterized by aridity, high drought risk, and overexploitation of groundwater resources for irrigation, a problem that has now reached critical levels. Based on experience and a systemic assessment of groundwater dynamics and water balance, it was realized that restoring a sustainable groundwater regime ultimately depends on reducing water depletion, i.e., reducing evapotranspiration (ET) by crops. It was also realized that it is not sufficient to control abstractions and promote "irrigation water use efficiency," as return flows and recharge are important elements of the water balance.

The project has developed an integrated water conservation strategy based on four innovations: (1) reduce ET and improve water productivity per ET unit as explicit objectives and operational targets; (2) improve infrastructure and operations to improve productivity and incomes; (3) develop institutions, allocation mechanisms, and supporting information-management systems to sustainably manage groundwater; and (4) establish a water supply organization and water user associations, forming a complete self-managed district irrigation and drainage system.

MWR considers that the project has been very successful in introducing and piloting these new approaches. Containing groundwater exploitation by introducing technologies to increase irrigation efficiency and/or reduce water demand through pricing has often resulted in increasing the pressure on the resource. Integrated approaches based on managing not just withdrawals but also depletion, on a sound

[3] Department of Irrigation, Drainage and Rural Water Supply of the Ministry of Water Resources and China Irrigation and Drainage Development Centre 2007.

water accounting basis, have become a necessity for critical groundwater systems, areas with significant conjunctive use of surface and groundwater, closing river basins , and systems characterized by high return flows (deltas and rice systems).

Looking beyond irrigation and the water sector

Linking water assets and livelihood: India's NREGA. The National Rural Employment Guarantee Act (NREGA) is a flagship program of the Indian government. Launched by the Ministry of Rural Development, it aims to enhance the livelihoods and financial security of households in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual labor. In financial year 2007–2008, 33.9 million households benefited from employment opportunities offered by 330 districts across India.

NREGA was especially able to generate employment in rural areas through initiatives that created features for water harvesting, renovating traditional water bodies, developing land, and boosting rural communication links. According to a financial statement released by the government, 64% of all investments were geared toward creating assets for conserving water and creating small-scale irrigation infrastructure. In 2007–2008, water storage facilities totalling 130 million m^3 were created by digging new ponds, building percolation tanks, and constructing small check dams. Some 66,000 ha came under irrigation.

Action areas

Modernize yesteryear's schemes for tomorrow's needs. Most irrigation schemes in the region were built before the 1980s, and have operated for 30–40 years. They are underused, poorly maintained, and inefficient. Many would benefit from modernization by being redesigned, operated, and managed for a range of uses. Smart irrigation technologies, both old and new, will be essential to meet changing demands. Surface irrigation schemes could be used to recharge aquifers or fill intermediate storage structures such as farm ponds, providing farmers with greater reliability and control. Meanwhile, flexible and responsive management will be vital for mitigating the effects of and adapting to climate change. Modernizers will also need to look beyond the confines of the irrigation systems and start managing operations within entire river basins, allocating water supplies and providing services for multiple uses, and meeting environmental targets.

Go with the flow by supporting farmers' initiatives. Although areas under surface irrigation have remained stagnant or have been shrinking, farmers have raised yields using locally adapted irrigation technologies to scavenge water from surface sources, wastewater, and groundwater. There are opportunities for investors to identify successful initiatives and direct funds toward schemes that emulate successful farmers' methods, but also provide management responses to unregulated resource use and sustainable financing for the whole water management system. New models are needed for managing groundwater in areas where "atomistic"

irrigation (where farmers pump water from aquifers) has been replaced largely by centralized surface irrigation.

Look beyond conventional participatory irrigation management/irrigation management transfer recipes. The need is for forms of institutions and service providers that can remain relevant to present and future farmers by providing the new services that they will demand, establishing a new compact between the systems providing irrigation water supply to rural areas and the farmers, deploying varied water management strategies, and also accommodating the multiple uses and users of agricultural water.

Professionalization of management; adoption of service-oriented management concepts; provision for performance incentives; and ensuring a sustainable system for financing operations, maintenance, and future upgrading are key issues to address for both system management and farmer organizations. Involving the private sector is certainly an option to consider. For example, irrigation departments could outsource irrigation services, create public–private partnerships, and/or provide incentives for irrigation officials to act as entrepreneurs in publicly managed operations.

Empower all stakeholders through knowledge. If these new approaches, which are all part of a modernization process of the sector, are to be successful, investors will need to direct funds toward capacity building and training at all levels of irrigation management, building the capacity of all stakeholders—including the irrigation bureaucracy as well as existing staff of irrigation agencies and farmer organizations, local governments and rural communities, research, and extension—and strengthening the links among them. Efforts might have to go beyond providing training, to revamping entire irrigation departments to empower their workforces. A key area of knowledge to develop is benchmarking and policy monitoring of investments, reforms, and results.

Target the poor and vulnerable through appropriate capacity-building and financing strategies for investment in intermediate agricultural water management technology. Improving the strategic balance in agricultural water management between irrigated agriculture and other agricultural water management practices that improve rainfed productivity will result in more effective and equitable overall investment by targeting the poorest and most vulnerable farmers and the farming systems wherein the greatest productivity gains can be achieved at the lowest cost.

Develop sound and integrated water conservation strategies. Accurate accounting and measurement of water use can help identify opportunities for water savings, increase water productivity, improve the rationale for water allocation among uses, provide understanding of the impacts of different options, and support better management outcomes. Investing in the deployment of sound water accounting and auditing capacities and supporting information systems is therefore an essential component of any policy or strategy for conservation, reuse, and recycling, and of any investment program that aims at conserving water

resources, achieving water savings and water productivity gains in agriculture, or transferring water from agriculture to other sectors.

Invest outside the irrigation sector. The irrigation sector is embedded within the region's wider political economy and is therefore affected by external forces. This situation will be felt more in the future. Policies and programs that influence agriculture, both directly and indirectly, come to drive developments in irrigation. These include, in particular, energy, rural infrastructure, and environmental and land tenure policies. Crafting policies to ensure that external influences on water services are properly understood and planned is one way to influence irrigation performance indirectly. Doing so could have an added impact on the irrigation sector.

References

Department of Irrigation, Drainage and Rural Water Supply of the Ministry of Water Resources and China Irrigation and Drainage Development Centre. 2007. *Outcomes of the World Bank Loan Water Conservation Project: New concepts and practices of water conservation*. Beijing.

International Water Management Institute (IWMI) and Food and Agriculture Organization (FAO). 2009. *Revitalizing Asia's irrigation: To sustainably meet tomorrow's food needs*. Sri Lanka: IWMI.

Molden, D., ed. 2007. *Water for food, water for life: A comprehensive assessment of water management in agriculture*. London and Colombo: Earthscan and International Water Management Institute.

Renault, D., T. Facon, and R. Wahaj. 2007. Modernizing irrigation management: The MASSCOTE approach; Mapping system and services for canal operation techniques. FAO Irrigation and Drainage Paper 63. Rome: FAO.

To Phuc Tuong, personal communication, International Rice Research Institute.

Van Steenbergen, F., and T. Shah. 2003. Rules rather than rights: Self-regulation in intensively used groundwater systems. In *Intensive use of groundwater: Challenges and opportunities*, ed. M. R. Llamas and E. Custodio, 241–256. The Netherlands: Balkema Publishers.

Wang, J, J. Huang, Z. Xu, S. Rozelle, I. Hussain, and E. Biltonen. 2007. Irrigation management reforms in the Yellow River basin: Implications for water saving and poverty. *Irrigation and Drainage Journal* 56:247–259.

Xuehui, Z., B. Xiaodan, and D. Bin. Forthcoming. Modernized irrigation management practices at Jiamakou Irrigation Scheme. Bangkok: FAO–RAP.

Chapter 6

Investing in natural resource management and environment services

Sustainable agriculture intensification means producing more food and agricultural products from the same overall resources. At the same time, it also means increasing contributions to sustain the management of natural resources and improve the provision of environmental services. This implies a revolution that is "greener than the Green Revolution." As the three featured cases here show— drawn from Session 3 organized by FAO in the Investment Forum—this is not impossible. The last article presents the highlights of a forum seminar connecting food security and the environment.

Profitable yet sustainable

Conservation agriculture

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A natural approach integrating ecological management with modern agricultural methods is reversing the process of soil degradation—and opening a most promising path to sustainable food security.

Driven by the new knowledge and technologies of the Green Revolution, world average cereal yields increased by more than 2% annually during the 1960s and 1970s (FAO 2002). In the Asia and Pacific region, the rate of increase in crop yields has slowed since then because of the degradation of land and water resources on which agriculture is dependent.

Agriculture in general in the region has been changing from traditional subsistence farming to modern commercial farming practices at various rates. This has led to specialized commercialized farming with mechanization, intensive tillage, and increased agrochemical use. The use of high inputs and labor-saving technologies has resulted in some cases in abandonment of important ecosystem-based practices such as crop rotation and diversified cropping.

Land degradation as a result of intensive tillage reduces yields and affects the efficacy of fertilizers as well as productivity, especially with wheat. Land degradation manifests itself as changes in the quality of soil, water, and other attributes that reduce the ability of land to produce goods and services that are valued by humans. The Global Assessment of Soil Degradation (Oldeman, Hakkeling, and Sombroek 1991) estimated that 38% of the world's croplands had been degraded as a result of human activity.

Soil erosion was identified as the major indicator of degradation, followed by loss of soil nutrients and other processes, including physical deterioration. Another study (Dent 1990) estimated that the proportion of the region's land that is free from soil-related constraints to agricultural production was only 14%. The region as a whole seems to have reached or passed the safe limits for the horizontal expansion of agricultural production.

Conventional "arable" agriculture is normally based on soil tillage for seed bed preparation; the "downturn" is the failure to develop an erosion-protective organic mulch cover. Soil tillage has in the past been associated with increased fertility, which arises from the mineralization of soil nutrients due to tillage. This process, however, leads in the long term to a reduction of soil organic matter and collapse of the soil structure.

The structural, biochemical, and hydrological degradation of soils from repeated tillage result in the formation of crusts and the compaction of deeper soil layers. Without organic soil cover, the result is diminished surface soil structure, increased water runoff, and severe soil and wind erosion. This process is most evident under tropical conditions because of high temperatures and heavy rainfall. Once fertile surface soils have been eroded, compacted subsoils inhibit water infiltration (particularly in the rainy season), leading to both rill and gully erosion.

Soil erosion resulting from soil tillage compels us to look for alternatives to reverse the process of soil degradation. The natural approach to this is minimum (or zero) mechanical soil disturbance. This produces many benefits and has led to movements promoting what has become generally known as conservation agriculture (CA). This involves zero tillage and protection of the soil with an organic mulch cover, and crop rotation and/or crop diversification. Practices such as the precise placement of agrochemicals and application of animal manure and crop residues can enhance the positive effects of CA. With the controlled movement of farm vehicles, CA also reduces soil compaction from excessive use of heavy machinery for field operations.

CA aims to conserve, improve, and make more effective use of natural resources through the integrated management of available soil, water, and biological resources, combined with purchased external inputs. It contributes to environmental conservation and enhances and sustains agricultural production. It can also be referred to as resource-efficient/resource-effective agriculture.

Natural ecosystems in their altered states have always been relied upon to support continuity of agricultural production and ecosystem services such as flood control, mediation of water quality, microclimate regulation, and biodiversity. Improper agricultural practices can reduce the ability of ecosystems to provide food and other services. But efforts to promote food security and environmental sustainability can often reinforce each other and enable all farmers to adapt to and mitigate the impact of climate change. Some of these efforts would be based on appropriate technologies such as CA and practices that restore natural ecosystems and improve the resilience of farming systems, thus enhancing food security.

Issues and challenges

Agricultural practices can reduce the ability of ecosystems to provide goods and services. For example, high applications of fertilizers and agrochemicals can increase nutrients and toxins in groundwater and surface water, resulting in health and

water purification costs and decreasing fishery and recreational values. Agricultural practices that degrade soil quality contribute to eutrophication of aquatic habitats and higher costs for increased fertilization, irrigation, and energy to maintain the productivity of degraded soils. Practices that change species composition or reduce biodiversity in non-agricultural systems may also diminish goods and services, because the ability of ecosystems to provide some services depends on both the number and type of species in an ecosystem.

An international meeting on agroecology in Brussels in June 2010 reported that most efforts to boost food production have focused on large-scale investments in land and developing a Green Revolution model, while scant attention has been paid to more effective agroecological methods. The meeting also noted that agroecological approaches resulted in an average crop yield gain of 79%. It was emphasized that these sustainable techniques must be rapidly scaled up to address simultaneously the problems of food insecurity, climate change, and depletion of natural resources.

As stated earlier, efforts to promote food security and environmental sustainability can often reinforce each other. In many cases, the more environment-friendly techniques may also prove to be more productive. Adopting the complementary approaches more widely and ensuring that they are targeted to benefit the poor could improve both food security and environmental sustainability.

CA is based on the principles of rebuilding the soil and optimizing crop production inputs and labor as well as profit gains. It advocates that the social and economic benefits gained from combining production targets and protecting the environment, including reduced input and labor costs, are greater than those derived from production alone. CA involves the integration of ecological management with modern, scientific agricultural production.

CA has been practiced for more than three decades now in different locations. Field results show that the introduction of crop rotation, no-tillage, and straw mulching is economically viable and that CA has the ability to control weeds and retain soil moisture, providing better conditions for plant development.

Despite the obvious benefits of CA, it still has to be widely adopted. The barriers to this could be intellectual, social, financial, biophysical, technical, infrastructure problems, or policy related. Knowing what the bottlenecks are is important in developing strategies to overcome them. Crisis situations that are likely to become more frequent as a result of climate change, and the political pressure for more sustainable use of natural resources and environment protection, provide opportunities to harness support for CA.

CA is still a new and little-known concept, whereas the majority of the world's farmers practice conventional, tillage-based farming. The primary constraints are intellectual—the CA concept is counterintuitive and contradicts the common tillage-based farming experience. There is also lack of experimental data on CA.

CA practice has still to be developed locally, depending on the specific farming and agroecological conditions. Long-term experience with CA globally has shown

that it does not present more or fewer problems to the farmer, but different ones like, for example, the completely new dynamics of CA systems, which require high-level management skills and a steep learning process for the farmer. Nevertheless, it should be noted that these problems can be hurdled. For instance, to adopt CA, a farmer merely needs a zero-tillage planter, which may be unavailable in the neighborhood. Buying one without knowing the system or without even having seen the system is a risk that few farmers will take. Machinery dealers might not wish to promote CA if not supported by extension trials, and also because the technology will reduce machinery sales, particularly of large tractors.

Before a significant number of small farmers can adopt CA practices, they will need access to competent technical assistance and long-term credit at affordable rates to purchase or share a minimum of equipment and machinery. However, CA can be practiced successfully as a manual system as well as with simple and affordable animal-drawn equipment.

A number of studies have sought to identify barriers to adoption of CA:

- Initial investment costs may discourage adoption.
- The perceived risk of adopting CA may serve as a barrier.
- Longer gestation periods for some of the benefits of CA to materialize may serve as a disincentive to farmers with short-term planning horizons, especially tenant farmers, although benefits can be harnessed immediately if the transformation is managed properly.
- Some barriers may be specific to a culture or its recent history.

Financial constraints to CA adoption include the lack of available capital and suitable market and service infrastructure to provide inputs and facilitate the processing and marketing of produce. These inputs include fertilizers; chemicals (herbicides); seeds for cover and rotational crops; and equipment for direct seeding, planting, and residue management—as well as a proactive attitude of the supply sector. Adequate policy is necessary to accelerate the adoption process considerably, e.g., by removing the constraints through a range of supports such as information and training campaigns, suitable legislation and regulatory frameworks, research and development, and incentive and credit programs.

Innovations and good practices

Main principles of conservation agriculture

CA maintains a permanent organic soil cover. Rather than removing crop biomass for animal feed or fuel, CA leaves such materials on the soil surface to reduce mineralization and increase levels of soil organic matter. Additionally, the retained biomass serves as physical protection of the soil surface from sunlight, rain, and wind. It also feeds soil biota and produces a favorable environment for soil fauna, particularly earthworms, which in sandier and silty soils provide all-important biopores to take water from the soil surface into the active crop root zone and eventually to the aquifer.

Retention of surface residues and the subsequent reduction in runoff reduce pollution of surface water and groundwater by agrichemicals, improve the efficiency of input use, and help with weed management. Further benefits include reduced use of fuel, labor, water, and fertilizers; less pollution; and increased carbon sequestration.

Experience has shown that techniques associated with CA involve much more than just reducing mechanical tillage but affect soil tillage altogether. In soil that is not tilled for many years, the crop residues remain on the soil surface and produce a layer of organic mulch. This layer protects the soil from physical impact and also stabilizes soil moisture and the temperature of the surface layers. This zone then becomes a habitat for a whole ecosystem of organisms, from larger insects down to soilborne fungi and bacteria. Those organisms macerate the mulch, incorporate and mix it with the soil, and decompose it so that it becomes humus. This in turn contributes to the physical stabilization of the soil structure. At the same time, this soil organic matter provides a buffer function for water and nutrients.

Larger components of the soil fauna such as earthworms provide a soil-structuring effect, producing very stable soil aggregates as well as uninterrupted macropores leading from the soil surface to the subsoil and allowing fast water infiltration in the event of heavy rains. This process is commonly called "biological tillage." It is not compatible with and is totally the opposite of mechanical tillage, which counteracts biological soil structuring processes.

Most tillage operations aim to loosen the soil, which inevitably increases the oxidation process, leading to soil organic matter mineralization and thus to a reduction in soil organic matter content. Organic matter in the soil is essential for soil life. Thus, agriculture with minimum mechanical soil disturbance is possible only when soil organisms are taking over the task of working the soil. This also has implications for the use of chemical inputs. Synthetic herbicides and mineral fertilizers have to be used in a way and in quantities that do not harm soil life or disrupt the biological systems in the soil and above the surface.

CA practices reduce soil degradation through reduced impact of rainfall, thereby reducing structural breakdown, with less erosion and diminished runoff. Hence, avoidance of tillage, and direct seeding through a protective organic soil cover are important elements of CA. Diversified crop rotation is important to avoid buildup of disease and pest problems. In addition, the accumulated soil cover ultimately helps manage weeds, although for the first few years, weeds may have to be controlled by conventional means like chemicals and/or physical removal.

Large areas of farmland in many countries in the region have been exhausted by continuous cropping of market-oriented crops such as soybean, maize, and cassava (Tivet 2005). Rapid recovery of degraded soils using CA in the Lao People's Democratic Republic increased the productivity of maize from 6.5 tons per hectare (t/ha) to 8 t/ha with a conventional ploughed system (Seguy et al. 2008).

The benefits of CA also include lower farm traffic; reduction in use of mechanical power and labor inputs, resulting in more timely field operations;

lower risk of crop failure; and ultimately higher yields, lower costs, and reduction in environmental pollution (FAO 2001; Kassam et al. 2009). The latter relates to reduced use of fossil fuels with associated reduction in greenhouse gas emissions, reduced use of fertilizer and chemicals, and hence improved carbon sequestration. CA saves 75% or more on fuel, uses about half the amount of herbicide, and requires at least 10% less water, which is equivalent to a million liters less on a hectare of land on most irrigated crops and as much as 30%–50% less with rice (Hobbs and Morris 1996).

Globally, CA systems are estimated to have been adopted on over 106 million ha largely but not exclusively in rainfed areas. This is equivalent to about 7% of the total world cropped area. The system is being adopted and promoted extensively in Argentina (58.8% of total cropped area), Paraguay (54.5%), Brazil (38.3%), Australia (26.9%), Canada (25.9%), and Kazakhstan (5.7%). In India and other South Asian countries, CA technology is taking place in the irrigated Indo-Gangetic plains, where the rice–wheat cropping system dominates. Similarly, the People's Republic of China (PRC) is promoting CA on rainfed and irrigated lands (Kassam et al. 2009).

Over the past two decades, as experience has been gained with this new approach to agriculture, CA technologies have been improved and adapted to all farm sizes, soil and crop types, and climatic zones. Technologies are now available to practice CA on small farms with animal traction and with only manual equipment (e.g., jab planters). The system has been adapted for cereals, pulses, vegetables, sugarcane, and root crops (Derpsch 2003). Perennial crops like fruits and vines can also be grown using CA techniques. Indeed, CA is practiced from the humid tropics to the Arctic Circle and on all kinds of soils.

Livestock production can be fully integrated into CA with the recycling of nutrients. This reduces the environmental problems caused by concentrated and intensive livestock production. It enables the farmer to introduce forage crops into the crop rotation, widening it and reducing pest problems. Forage can often be used as a dual purpose crop for fodder and soil cover. In addition, forage crops can add a substantial amount of organic carbon to the soil and improve soil health and structure. In arid and semiarid areas with low production of biomass, the allocation between the use of organic matter to feed the animals and to cover and feed the soil must be managed differently.

Major advantages of conservation agriculture

CA provides a number of other advantages at the global, regional, local, and farm levels:

- It provides a truly sustainable production system, not only conserving but also enhancing natural resources and increasing the variety of soil biota, fauna, and flora (including wildlife) in agricultural production systems, without sacrificing yields or production levels.
- CA-based production acts as a sink for carbon dioxide, and when applied on

a global scale, it could be a major contribution to controlling air pollution and global warming.

- Soil tillage is the most energy consuming of all farming operations. By not tilling the soil, farmers can save between 30% and 70% of time, labor, and fossil fuels as compared with conventional cropping.
- CA produces yields comparable to modern intensive agriculture but in a sustainable way; yields and profit margins tend to increase over the years, with both yield variation and input requirements decreasing.
- For the farmer, CA is attractive, as it allows a reduction in production costs, time, and labor, particularly in the peak times of planting; in mechanized systems, it also reduces the costs of investment and maintenance of machinery.

With CA, farming communities become providers of more healthy living environments for the wider community through reduced use of fossil fuels, pesticides, and other pollutants, and through conservation of environmental integrity and services. At the same time, CA is generally more profitable for the farmer (Knowler and Bradshaw 2006; Baker and Saxton 2007).

CA strives to develop a balanced coexistence between rural and urban societies, based on increased urban awareness of the environmental benefits and services provided by the rural sector. It works with the international and national marketplace to develop financial mechanisms to ensure environmental benefits.

A recent example from which lessons can be drawn is the marketing of carbon credits under the Kyoto Accord. Although this system does not yet apply to agriculture, it is increasingly being discussed in this context. This is only the beginning. Many other opportunities for environmental payments will develop in the future, including the potential for farm products produced under CA to be sold under a new "conservation label," which is now the case in Argentina. The rapid adoption of conservation technologies by farmers in many areas of the world, often without government support, is clear evidence of the economic benefits that accrue from these practices.

Action areas

There are many case studies of successful CA in South and North America, Australia, and more recently in Asia, but fewer in Africa and the Middle East (Kassam et al. 2009). The main constraints to its implementation are lack of knowledge, skills, suitable equipment/machinery/tools, and the vision required to propel it.

Promotion of CA for both small- and large-scale farmers. Most countries consider only initial costs. However, many success stories in countries such as Brazil, the PRC, and Paraguay, involving both large and small farmers, show that the technology is truly cost effective in the long term.

Development of institutional framework and national road map. The institutional framework for the introduction and spread of CA will require

strengthened monitoring and evaluation capacity. Adopting CA on a small, nonmechanized farm involves different considerations from adopting on a large, mechanized farm. For example, as smallholders use few purchased inputs, non-herbicide-dependent strategies for weed management in CA have to be applied.

Increasing access to credit. The availability of credit to assist with needs for different equipment is important. However, if smallholders hire land preparation equipment, then a switch to CA should be relatively simple, as past investment in conventional equipment is not a consideration. Short-run costs would be close to long-run costs when switching to CA. In a number of cases, very small-scale farmers adopted CA without any new inputs, using a narrow hoe to open planting holes for the seeds rather than hoeing the entire surface of the field.

Availability and access to knowledge and information on CA. The adoption of CA depends primarily on farmers' perceptions of its short-term and medium-term economic benefits relative to conventional systems. Thus, information has to be relevant, actual, locally appropriate, and useful to generate interest among farmers. The superiority of the CA system over conventional tillage has generally been proven under a great variety of conditions worldwide (Derpsch and Friedrich 2009). What is necessary is to develop and adapt the system to local conditions and study possible limitations (i.e., availability of machines, herbicides, adequate crop rotations, adequate green manure cover crops, technical knowledge).

We should not be overconcerned with lower yields in the initial phases of CA adoption. Yield loss, if not competitive with the conventional system, especially in the initial years, can be compensated for by additional yield from multiple cropping during the extended cropping period (Crosson, Hanthorn, and Duffy 1986). In general, the risk of obtaining lower yields in the initial phase of transition is overrated. In most cases, yields remain the same or even increase from the beginning. Yield decline, if it occurs, is mostly a result of mistakes in management because of inexperience, which can be overcome with adequate technical assistance.

Erosion control; improvement of hydrological, chemical, physical, and biological soil conditions; lower machinery costs; reduced labor and tractor hours; higher economic returns; and other benefits of the system will guarantee the steady growth of CA in most regions of the world. As the further degradation of agricultural land, increasingly scarce water resources, and unpredictable climatic conditions become more apparent, the need for a new paradigm will become evident. The analysis in Africa showed that conventional farming practices remain viable only with high rainfall (Mazvimavi and Twomlow 2008). Under high rainfall conditions, the reported maize yields were 1,650 kilograms (kg)/ha and 2,900 kg/ha for conventional and CA practices, respectively. In low rainfall conditions, the maize yields decreased to 370 kg/ha and 1,780 kg/ha for conventional and CA practices, respectively.

Experience shows that there are no system-inherent reasons for lower yields with CA other than the lack of knowledge of the farmer. Where land productivity

is low, as is normally the case with the poorest farmers, with good guidance, yields will normally rise rather than drop even in the first year after changing to CA.

More specific strategies to convert to CA are needed to enable farmers to see its attractions and to encourage them to make the initial investment. Good information on potential benefits, opportunities, and constraints is a prerequisite for farmers in making their choice. A key intervention here will be a series of demonstration plots where farmers can see the benefits with their own eyes.

The experiences in South America indicate that a large-scale shift to CA requires close collaboration between innovative farmers and the private sector to develop and disseminate appropriate equipment. The testing, manufacture, and provision of required tools and implements, cover crop seeds, herbicides, and spraying equipment through local markets are critical.

Access to information is very important in reaching a critical mass of CA practitioners, both within and between countries and organizations. Selected case study material describing CA experiences under different conditions can be made available, and researchers can help validate information such as the selection of cover crop species and adaptation of different equipment.

The transfer of the concepts, principles, and technologies of CA needs network interchange within and between countries to facilitate sharing of known solutions. Such networks can accelerate the advancement of knowledge and techniques being steadily accumulated by both national institutions and community groups in their efforts to reverse land degradation on a global scale.

Policy support, services, and infrastructure for an enabling environment. To spread CA rapidly and widely, government policies, support services, and infrastructure are necessary to create an enabling environment. Development of an appropriate set of incentives is also crucial such as the identification and multiplication of seeds and supply of equipment through public and private sector involvement. Media campaigns and market development of new crops that will fit in a diversified crop rotation under the CA system are also other means to be considered.

The negative impact of climate change and political pressures to encourage sustainable natural resource use and management provide opportunities to support the adaptation and spread of CA. This is the most promising path for attaining sustainable food security (Friedrich and Kassam 2009; Kassam et al. 2009).

To accelerate the mainstreaming of CA, a global network of interconnected communities of practices was proposed at a stakeholders' meeting in July 2008 (FAO 2008). In early 2009, a global communication platform for the CA community of practice was launched by the Food and Agriculture Organization, as recommended by the stakeholders' meeting.

References

Baker, C. J., and K. E. Saxton. 2007. The "what" and "why" of no-tillage farming. In *No-tillage seeding in conservation agriculture*, ed. C. J. Baker and K. E. Saxton. London: Food and Agriculture Organization (FAO) and Centre for Agricultural Bioscience International (CABI).

Crosson, P., M. Hanthorn, and M. Duffy. 1986. The economics of conservation tillage. In *No-tillage and surface-tillage agriculture: The tillage revolution*, ed. M. A. Sprague and G. B. Triplett. John Wiley and Sons.

Dent, F. J. 1990. Land resources of Asia and the Pacific: Problem soils of Asia and the Pacific. RAPA Report 6. Bangkok: FAO.

Derpsch, R. 2003. Conservation tillage, no-tillage and related technologies. In *Conservation agriculture*, ed. L. Garcia-Torres, et al., 181–190. Kluwer Academic Pub.

Derpsch, R. and T. Friedrich. 2009. Global overview of conservation agriculture adoption. Proceedings, Lead Papers, 4th World Congress on Conservation Agriculture, 4–7 February 2009, 429–438. New Delhi, India.

FAO (Food and Agriculture Organization). 2001. *The economics of conservation agriculture*. Rome: FAO.

_____. 2002. *World agriculture: Toward 2015/2030 summary report*. Rome: FAO.

_____. 2008. *Investing in sustainable agricultural intensification: The role of conservation agriculture; A framework for action*. Rome: FAO. www.fao.org/ag/ca/.

Friedrich, T., and A. Kassam. 2009. Adoption of conservation agriculture technologies: Constraints and opportunities. IVth World Congress on Conservation Agriculture, February 2009, New Delhi.

Hobbs, P., and M. Morris. 1996. Meeting South Asia's future food requirements from rice–wheat cropping systems: Priority issues facing researchers in the post-green revolution era. NRG Paper 96–01. Mexico, D.F.: CIMMYT.

Kassam, A., T. Friedrich, F. Shaxson, and J. Pretty. 2009. The spread of conservation agriculture: Justification, sustainability and uptake. *International Journal of Agricultural Sustainability 7* (4): 292–320

Knowler, D., and B. Bradshaw. 2006. Farmers' adoption of conservation agriculture: A review and synthesis of recent research. 32:25–48.

Mazvimavi, K., and S. Twomlow. 2008. Conservation farming for agricultural relief and development in Zimbabwe. In *No-tillage farming systems*, ed. T. Goddard, M. A. Zoebisch, Y. T. Gan, W. Ellsi, A. Watson, and S. Sombatpanit. Special publication no. 3, World Association of Soil and Water Conservation (WASWC).

Oldeman, L. R., R. T. A. Hakkeling, and W. G. Sombroek. 1991. Word Map of the status of human-induced soil degradation: An explanatory note; Global Assessment of Soil Degradation (GLASOD). Wageningen and Nairobi: International Soil Reference and Information Centre and United Nations Environmental Program.

Seguy, L., D. Loyer, J. F. Richard, and E. Millet. 2008. Sustainable soil management: Agro-ecology in Laos and Madagascar. In *No-tillage farming systems*, ed. T. Goddard, M. A. Zoebisch, Y. T. Gan, W. Ellsi, A. Watson, and S. Sombatpanit. Special publication no. 3, WASWC.

Tivet, F. 2005. Development and implementation of direct-seeding mulch based cropping systems in Southeast Asia. Case studies from the Lao National Agro-Ecology Programme, Annual activity report, 9–20. Montpellier, France: CIRAD.

Ecosystem approaches to coastal resources management

The case for investing in mangrove ecosystems

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Across Asia, mangrove forests are fast disappearing at an alarming rate, but ecosystem methods are devising ways to restore them and the natural protection they provide to sustain the living world.

The ecosystem approach is a strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way (Secretariat of the Convention on Biological Diversity 2004). It is particularly applicable to the sustainable management of mangrove forests because of their location at the land–sea interface and the close ecological links prevailing among the vegetation, soil, water, and intertidal and aquatic animal species, which together provide a wide array of valuable goods and services to millions of coastal dwellers worldwide (Aksornkoae 1993; Macintosh and Ashton 2002; Hogarth 2007).

The concept of ecosystem approaches was developed in the 1960s, drawing from various disciplines including conservation biology, ecology, and the social sciences. Ecosystem-based management builds on these earlier approaches by incorporating elements of environmental planning and resource sharing while maintaining an explicit focus on the management of human impacts within the ecosystem (Kappel et al. 2006). In relation to the coastal zone, these approaches

are applied collectively in the form of integrated coastal management (ICM). The Convention on Biological Diversity outlines 12 principles that form the basis for the ecosystem approach. These principles are recommended to guide the implementation of projects and other investments in the coastal zone (Box 1).

Box 1: Principles of the ecosystem approach

1. The objectives of management of land, water, and living resources are a matter of societal choice.
2. Management should be decentralized to the lowest appropriate level.
3. Managers should consider the effects of their activities on adjacent and other ecosystems.
4. Potential gains from management should be recognized; there is usually a need to understand and manage the ecosystem in an economic context.
5. Ecosystem structure and functioning should be conserved in order to maintain ecosystem services. This should be a priority target.
6. Ecosystems must be managed within the limits of their functioning.
7. Action should be undertaken on the appropriate spatial and temporal scales.
8. Objectives for ecosystem management should be set for the long term.
9. Management must recognize that change is inevitable.
10. Action should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. Action should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations, and practices.
12. The approach should involve all relevant stakeholders of society and scientific disciplines.

Source: Secretariat of the Convention on Biological Diversity 2004.

The advantages of adopting an ecosystem-based approach are evident from the wide range of services, or benefits, that people obtain from ecosystems. In the case of mangroves, the Millennium Ecosystem Assessment (2005) groups these services into four categories, covering both use and non-use benefits:

- **Regulating services:** protection of beaches and coastlines from storm surges, waves, and floods; reduction of beach and soil erosion; stabilization of land by trapping sediments; water quality maintenance; sequestration of carbon dioxide; and climate regulation
- **Provisioning services:** subsistence and commercial fisheries (food, habitat, and nursery ground for aquatic life), aquaculture, honey, fuel wood, building materials (timber), and traditional medicines

- **Cultural services:** tourism and recreation, and spiritual appreciation
- **Supporting services**: cycling of nutrients, and habitats for species

These mangrove ecosystem goods and services are the key attributes sustaining economic activities in Asian countries at both a commercial and subsistence level.

Policy makers, investors, and developers need to take into account the particular complexities of coastal ecosystems, especially their interrelationships with other upstream and downstream processes, and their generally high economic value. Usually, however, investment appraisals of large infrastructure development projects do not adequately consider the economic costs/risks resulting from altering downstream river flows that can impact on mangroves and coastal fisheries. Economic valuations and investment decisions need to incorporate not only the direct costs and benefits of an intervention, but also the socioeconomic consequences of other alterations or losses in terms of ecosystem services in the longer term.

For example, converting a mangrove area to shrimp ponds may be financially attractive to investors in the near to medium term, but experiences in many countries have shown that mangrove shrimp farming is not viable in the longer term because of the gradual loss of ecosystem productivity resulting from the clearance of the mangroves. Worldwide, 800,000 hectares (ha) of mangrove may have been destroyed to build shrimp farms (Hogarth 2007). This represents an enormous loss in terms of mangrove ecosystem services that were valued more than 10 years ago at almost $10,000 per ha per annum (Costanza et al. 1997).

The lack of comprehensive information about coastal ecosystems, especially the true value of mangrove forests and coral reefs, has led to past large-scale destruction or degradation of coastal resources, resulting in immense economic losses/costs. Conversely, putting new, more accurate monetary values (price tags) on coastal ecosystems and their goods and services is a powerful tool to influence policy makers in favor of sustainable coastal development choices. Recent global estimates suggest that, in terms of a nation's economy, coral reefs and mangroves provide an annual value of $100,000–$600,000 and $200,000–$900,000 per square kilometer (km^2), respectively (UNEP–WCMC 2006). Overall, coastal ecosystem services have been estimated to be worth over $25,000 billion annually—"ranking them among the most economically valuable of all ecosystems." (Nellemann et al. 2009)

In the face of climate change, many of the regulating services of mangroves are actually becoming more necessary and valuable, especially their buffering capacity against storms and flooding. Mangroves can hold back the sea and reduce wave forces with their extensive and dense aboveground roots by an estimated 70%–90% on average, or by 20% per 100 meters (m) in the case of mangrove green belts in Viet Nam. Mangrove forests also moderate climate extremes by providing shade and increased humidity, while also reducing wind velocity and soil water evaporation.

Mangroves and other coastal ecosystems, such as tidal salt marshlands and seagrass meadows, are also important global carbon sinks. These coastal wetlands are able to bury large quantities of carbon at a rapid rate (UNEP 2009). In the case of mangroves, this is aided by their extensive root systems, which develop both above and below ground. Globally, mangroves may be accumulating between 0.009 and 0.038 gigaton of carbon per year, which, when their limited area of coverage is taken into account, suggests that they sequester carbon faster than terrestrial forests. However, current patterns of use, exploitation, and impacts will, if left unchecked, potentially lead to mangroves becoming carbon sources rather than sinks. Conversely, there are now opportunities to include mangroves in some of the emerging forest carbon marketing mechanisms, provided suitable technical and financial models can be developed.

Mangroves also support and enrich coastal fish and shellfish populations vital to the nutrition and subsistence livelihoods of millions of coastal dwellers, as well as sustain the commercial fisheries and aquaculture sectors. The ecosystem-based approach recognizes that mangroves are critical to the life cycles of many of these species, e.g., mud crabs, especially during their juvenile life stages; thus, protecting mangroves helps to sustain coastal fish/shellfish stocks, even in the face of heavy fishing pressure.

This paper looks at the socioeconomic benefits of applying the ecosystem approach in the coastal zone, especially in relation to mangrove forests and food security. It draws on examples and lessons learned from applying ecosystem-based and participatory approaches in sustainable coastal management projects in Southeast Asia. Four case studies are presented to demonstrate the importance of mangrove conservation to protect food security and livelihoods. From these case studies, a number of action areas and recommendations are presented highlighting research and knowledge gaps, plus emerging issues, especially the need to invest in adaptation responses to the growing threats from climate change in the coastal zone.

Issues and challenges

Mangrove ecosystems are particularly dynamic and productive, features that create both opportunities and challenges for innovative management and investment opportunities. Many tropical coastal areas are dominated by mangrove forests and associated vegetation (e.g., nipa palm, seagrasses). This important intertidal wetland community is maintained by many ecological processes determined by the flows of water, sediments, nutrients, organic matter, and animal populations that move through and within the ecosystem (Robertson and Alongi 1992; Hogarth 2007). Mangroves flourish best in estuaries, deltas, bays, lagoons, and other sheltered coastal locations, where they are influenced by both freshwater and seawater. This makes them highly productive ecosystems providing

habitat and food for many commercially important fish, crustacean, and molluscan species (e.g., Robertson and Blaber 1992), but the dynamic nature of the processes that support this productivity, especially the delicate hydrological system, makes mangrove ecosystems particularly difficult to manage.

Despite growing awareness of their value, mangroves are still being degraded and lost at an alarming rate across Asia. Mangrove ecosystems have been degraded, or converted for agriculture, aquaculture, and industrial and urban development areas. The global coverage of mangroves in 1997 was 181,000 km^2 worldwide (Spalding et al. 1997). A more recent estimate by the Food and Agriculture Organization indicates that the figure may be below 150,000 km^2, and many species are reported to face the threat of extinction because of human activities (Polidoro et al. 2010). The scale of human impact on mangroves has increased dramatically in recent years, with many countries showing losses of 50%–80% or more, compared with the mangrove forest cover that existed even 50 years ago. The Philippines, for example, has lost 75% of the mangrove area that existed in the 1950s (Primavera 2000). The livelihoods of many local coastal communities have been severely diminished or even lost as a result. Recent typhoons in Bangladesh, India, and Myanmar have shown that peoples' lives and property are at much greater risk without the storm protection that mangroves can provide. On an economic basis, Das (2008) estimated the value of the storm-protective services of mangroves in Orissa, India to be $4,335 per ha of mangrove forest land.

There has been considerable investment in planting mangroves, but not enough attention has been paid to their long-term restoration and sustainable use. The cost of planting mangroves is typically within the range of $100–$200 per ha in Asia, making it a relatively low-cost and popular investment. However, this is only the direct seedling procurement and planting cost; it does not take into account the survival rate of the seedlings, which is dependent on a variety of factors, including the soil and hydrological conditions, climatic influences, and the need to protect and manage plantation areas. Because of these factors, which are sometimes compounded by poor site selection and/or choice of species, the survival rates for planted mangrove seedlings have often been very poor (de Leon and White 1999). Some practitioners have actually argued that "ecological restoration" based on natural seedling recruitment has many advantages over the widespread practice of planting mangroves (Lewis 2001).

Technically sound and well-costed mangrove restoration, protection, and sustainable use models are urgently needed, including benefit–cost analyses based on the services that restored mangroves provide. It is also important to understand how mangrove plantations compare in relation to the services provided by natural mangrove forests. In a recent study in Kenya, resource users rated natural mangroves more highly than plantations (Ronnback et al. 2007). In Thailand, it has been shown that biodiversity recovery in replanted former mangrove areas reaches levels almost comparable to the biodiversity of natural mangrove forests (Macintosh and Ashton 2002), and plantations appear to be at least as productive

as natural mangroves in terms of the fish and shellfish abundance they support (Crona and Ronnback 2005, 2007). This is an important conclusion, because on a global basis the annual market value of mangrove-associated fishery products may average $3,000 per ha (Ronnback 1999), whereas mangrove restoration costs, including seedling gap-filling and plantation protection for the first 5 years, can be as little as $400 per ha (data for India from Hirway and Goswami 2004).

More integrated management systems are needed for mangrove ecosystems. Governments, development agencies, and nongovernment organizations (NGOs) have responded to the dramatic loss of mangroves by adopting policies and projects to replant mangrove forests and introduce more sustainable management systems. However, the management aspects in particular require a radical rethink away from the traditional sectoral exploitation of mangroves towards their conservation, restoration (or rehabilitation), and "sustainable use" as defined by the Convention on Biological Diversity, or "wise use" as defined specifically for wetlands by the Ramsar Convention (2006): "Wise use of wetlands is the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development."

In practice, this means that both investment and management actions should follow the ecosystem-based approach, which considers mangroves to be an integral part of the coastal zone linked to other adjacent marine and freshwater/terrestrial ecosystems. This approach is more holistic and sound compared with the prevailing view that mangroves are only one isolated element of the coastal zone, or worse still, are "just trees."

The role that healthy mangroves can play in terms of food security and livelihood provision is commonly undervalued/overlooked, especially the ecological links between mangroves and coastal fisheries. Some of the most important innovations needed in mangrove ecosystem investment and management are sustainable fishing and aquaculture practices. These maximize mangrove food production without depleting key species or damaging the ecosystem in other ways, and do not exclude traditional subsistence users.

Investment in mangrove services has high potential, but few proven mechanisms exist. Ecosystem services are the benefits people obtain from mangroves or other natural ecosystems, either directly (e.g., food, fuelwood, water supply) or indirectly through cultural, regulatory, and supporting services. "Payment for Ecosystem Services" links the owners (or sellers) of ecosystem services to the beneficiaries (or buyers) of environmental services through financial payments. The ecosystem-based approach opens up opportunities to apply Payment for Ecosystem Services to mangroves. One example is REDD (Reducing Emissions from Deforestation and Forest Degradation), which includes a set of steps designed to use market/financial incentives to reduce the emissions of greenhouse gases from deforestation and forest degradation. The primary objective is to reduce greenhouse gases, but it can deliver "cobenefits" such as biodiversity conservation and poverty reduction. REDD credits offer the opportunity to utilize funding from

developed countries to reduce deforestation in developing countries. Mangroves have recently been included in the forest categories eligible for REDD.

Innovations and best practices involving mangrove ecosystems

Mangroves or shrimp farms? The case of Tha Po Village, Thailand

A study using partial valuation compared the net benefit from conservation of mangroves with the net benefit from their conversion to shrimp farms in Tha Po Village, Kanjanadit District, Surat Thani, located on the Gulf of Thailand. The villagers had traditionally utilized mangroves for both wood and nontimber forest products (NTFPs), but excessive conversion of mangrove to shrimp farms seriously affected their livelihoods. Economic and environmental problems started to emerge, such as a drastic decline in offshore fishery yields, and water pollution from farm effluent. In addition, some villagers' houses were made more vulnerable and suffered from storm surges because no mangroves were left to serve as a windbreak. From 1993, the villagers protested against the encroachment by shrimp farmers, leading to community action to protect the remaining mangroves of 2,500 rai[1] (400 ha), or about 35% left for traditional use (Sathirathai 1998).

The benefits from the remaining mangroves comprised both products (wood to make fishing gear, and NTFPs, mainly fish, shrimp, crab, mollusks, and honey) and indirect benefits in terms of mangrove–fishery linkages and coastal protection. A valuation study (Pongthanapanich 2008) estimated the mean annual value per household from direct use of wood and nonwood products at $1,155 (B36,984).[2] The aggregate annual value for the entire remaining mangroves was $43, 919 per annum or $18 per rai.[3]

The supply and demand functions of fishery products for the community were also estimated to measure the welfare impacts of the change in mangrove area on offshore fisheries.[4] Two different assumptions of management regimes were used for the valuation: (1) *open access*, i.e., first-come, first-served fishing basis, assuming that the fishers sell fishery products at a price equal to average cost; and (2) *managed fisheries*, i.e., under a private/community property regime, the fishers sell the products at a price equal to marginal cost. The results showed that the economic values ranged from $4.2 to $14 per rai per year (B133–B441) under

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1 A Thai unit of area: 6.25 rai = 1 ha.

2 The study applied an exchange rate of B32 = $1 (B for Thai baht).

3 Market prices were used to calculate the net benefit of wood and nonwood products. Assumptions on the households' collection of wood and nonwood products were made as a basis for calculating the benefits from the entire remaining mangrove area.

4 The supply function was estimated based on the production function approach using a model that was applied to evaluate the offshore fishery production in which the mangrove area is included as one of the input factors.

the open access regime, but were much more consistent for the managed fisheries regime at $10.5 per rai per year (B333–B335). These mangrove values represent the flow of annual income loss from offshore fisheries because of mangrove removal.

A replacement cost method was applied to assess the windbreak and shoreline stabilization functions provided by mangroves. Given a unit cost of $1,094 per m for constructing breakwaters to prevent erosion, a windbreak of 1 m wide, and approximately 30% of the coastal area suffering from severe erosion, the replacement cost to protect the shoreline was $389 per rai per year. This is a proxy for the value of the coastal protection service provided by mangroves in the area. By adding the direct and indirect use values estimated above, conserving mangrove in Tha Po Village contributed an economic value in the range of $411–$420 per rai per year, or more than $2,500 per ha.

This study also evaluated the financial and economic returns from shrimp farming in the area. These were compared with the benefits from preserving the mangroves using a 20-year time frame. The results implied that converting mangroves to shrimp farming was financially feasible, but not economically viable when the external costs of shrimp farming, i.e., cost of water pollution (calculated based on effluent treatment cost and rice production loss caused by saline water intrusion from shrimp farms) and mangrove deforestation (calculated based on costs of rehabilitating abandoned farms, and replanting and maintaining mangroves) were factored into the analysis.

This study tended to underestimate the economic value of mangroves in terms of offshore fishery linkages and to overestimate the coastal protection benefit. The study also overlooked other important potential economic direct use values, especially those from recreation; and option values and non-use values were completely absent. However, this makes an even stronger case for the conclusion that, from a societal viewpoint, it was not economically desirable to convert mangroves to shrimp farms.

The study also estimated that the local community benefited from the mangroves by almost $44,000 annually from subsistence uses alone. It concluded that strengthening the communal property rights by applying a community forest law could be used as an effective management tool to reduce the problem of open access, thus reinforcing the community's incentive to conserve the resource.

Mud crab farming: Thai Binh Province, Viet Nam

One of the most sustainable and profitable small-scale aquaculture practices is the rearing of the mangrove or mud crab (genus *Scylla*), a common mangrove crustacean throughout the Indo-West Pacific region. Mud crabs have a high economic value because of their large adult size and high meat content. In addition, gravid females (also known as egg crabs) are highly valued in many countries, and are fished principally for the export market. Overfishing of mud crabs has been a widespread problem, whereas mud crab farming can add significantly to the value and sustainability of this resource.

Thai Binh Province is one of the coastal provinces in the southern part of the Red River Delta. Its coastline is composed of mudflats, mangroves, and small sand islands located within the river mouths. Overton and Macintosh (2001) reported that about 70% of households in Thuy Hai Commune farm mud crabs in earthen ponds. The ponds range in size from as small as 1,200 m^2, which are artificially stocked, to huge 50-ha ponds for extensive culture, where the crabs enter naturally with the inflow water, plus some additional small crabs purchased from fishermen. These extensive ponds also trap and hold other aquatic products, including wild shrimp and fish, and are often "planted" with seaweed.

The majority of aquaculture ponds are situated in front of the main sea dike but behind an area of mangrove trees planted in the 1990s that acts as a buffer zone against typhoons. The water quality is guaranteed to be much better in front of the sea dike, particularly since a large number of the farms rely on tidal water exchange. In recent years, coastal aquaculture has become more developed, and formerly large extensive ponds have been subdivided into smaller, semi-intensive operations. All the ponds have a simple sluice gate for water exchange and are surrounded by some form of fencing to prevent the crabs from escaping. This form of aquaculture is based on the mangrove ecosystem, which provides both coastal protection to the ponds and a supply of crab seed and natural food to support crab rearing. Other reasons for the success of this mangrove–aquaculture system are summarized in Box 2.

The important features of this example of good practice are multiple. The mud crab is a natural (i.e., well-adapted) mangrove species much more suited to small-scale farming than shrimp and other species that carry much higher investment risks. Juvenile crabs can also be harvested sustainably, provided that sufficient areas of mangrove habitat are protected and managed as a community resource. (And in this regard, "crab banks"—mangrove forest areas identified by fishing communities as key habitats to sustain the mud crab population—have proved very successful in Thailand, for example.) Poor people can benefit by catching juvenile crabs or collecting natural crab food to sell to the pond owners, or by providing labor. Local people recognize that there is a positive correlation between the area of mangroves and the quantity of wild mud crabs available, thereby making it easier to convince them of the importance of conserving the mangroves as an ecosystem support service in relation to mud crab farming.

Comanagement of mangrove resources in the Mekong Delta: The Case of Vinh Hai Commune, Viet Nam

A further innovation in relation to food production in mangrove ecosystems is comanagement, based on the principle that those who catch, collect, or rear fish/shellfish (or gain any other benefits from the ecosystem) should be willing to pay toward the cost of protecting/improving the mangrove forests on which their livelihood activities depend.

Box 2: Reasons for the successful development of mud crab farming in Thai Binh

Physical characteristics
The coastal mud flats within Thai Binh Province are accreting rapidly because of sedimentation from the Red River. Every 5 years, about 250–300 ha of "new coastal land" is formed. This new land is suitable for pond construction and benefits from a plentiful coastal water supply.

Water supply
The freshwater input from the Red River results in brackishwater conditions ideal for coastal aquaculture. Moreover, the level of local water pollution is low because of lack of urbanization and agriculture in the immediate area.

Accessibility
Sea dikes not only protect local villages against storm damage, but also provide the main road system between neighboring communities. Seed, feed, and harvested aquatic products are transported without difficulty. The sea dike also serves as a focal trading point where traders, farmers, and fishermen can trade mud crabs.

Seed and feed supply
The mangrove protection belt provides the habitat for juvenile mud crabs as well as other aquatic species. This has resulted in an increase in juvenile mud crabs caught in stock ponds, providing a plentiful seed supply to support mud crab farming. Moreover, food sources for aquaculture such as low-value fish species, small mangrove crab species, and mollusks are abundant in the mangrove buffer zone.

Socioeconomic factors
A strong community-based structure, along with the entrepreneurial spirit and hard-working attitude of the local people, has created the opportunity for many coastal communities to benefit from crab farming. The direct beneficiaries from aquaculture tend to be to the wealthier and enterprising sectors of the community, who can afford to invest in mud crab culture. However, the poorer fishers also benefit from collecting crab seed and food materials to sell to the crab farmers and by providing labor for many aspects of pond operation: building and repairing of ponds, harvesting, guarding against poachers, etc. Hand collecting of juvenile mud crabs from the mangrove areas is carried out mainly by women and sometimes by children. Both men and women, young and old, are involved in buying and selling crabs, either as primary or secondary dealers. These additional activities spread the economic benefit of crab production widely throughout the community.

In 1998, the Government of Viet Nam launched a national reforestation and forest protection program, which provided forest protection contracts signed with individual households. But subsequent assessments showed that these contracts had not worked well. In 2007, the Au Tho B in Vinh Hai Commune was selected as a pilot site for comanagement under a German-funded project (Schmitt 2009). This village included poor, landless people from ethnic minority groups whose livelihoods were dependent on subsistence collecting in the mangrove forests. Through community consultation, 240 mangrove user households were identified and divided into six groups based on geographical criteria. In 2009, a resource use agreement was signed between each user group and the local authority (Commune People's Committee) "to enable comanagement practice to protect the forest and rationally and sustainably use natural resources within Au Tho B coastal area."

The comanagement system in Au Tho B village is based on zones (land areas) where different management regimes apply, ranging from mangrove protection zones to rehabilitation zones that allow natural resources recovery to sustainable use zones for catching/collecting fish, crabs and cockles. Village members agree to follow the rules established for each zone, supported by regular monitoring by the authorities. Some examples of the permitted and prohibited activities in the rehabilitation zone outside the mangrove forest are as follows.

Permitted

- Only members of comanagement group can enter to catch fish
- Catching juvenile crabs, elongated gobies, and cockles when the tide is low and mud is visible
- Catching by hand or round nets (with diameter less than 50 centimeters [cm])
- Using long hooks to catch crabs
- Using bamboo trapping baskets for collection

Prohibited

- Nonmembers of comanagement group entering the zone
- Entering the forest when mud is not clearly visible
- Damaging small trees
- Using chemicals and electric fishing devices
- Round nets bigger than 50 cm in width
- Using long nets

In summary, the main benefits from this comanagement approach to ecosystem-based management in Soc Trang are (1) effective protection of mangrove forests, (2) livelihood improvement for the villagers, (3) participation of community resource users in planning and decision making, (4) further reduction of the workload of authorities because of the decentralized/community-based management approach, and (5) more just benefit sharing established as part of an ICM approach.

Community-led ecosystem-based adaptation: Inner Gulf of Thailand

Erosion is a critical problem along many coastlines in Asia. Human activities in drainage basins and on coastal plains have led to a decrease in sediment supply to the coast, caused mainly by dam construction, sand mining, and irrigation, and

by human-induced relative sea-level rise because of land subsidence resulting from excess groundwater extraction (Saito et al. 2007). These activities, together with the destruction of mangroves and other coastal ecosystems, have resulted in severe coastal erosion in the Gulf of Thailand.

Over the past 30–40 years, the average land recession rate has been 1.2–4.6 m per year, but 11% of the Gulf of Thailand experiences more than 5 m of erosion every year, which is equivalent to 2 km^2 of coastal land loss valued at $156 million per year (World Bank 2007). The coastline, once covered by lush mangroves, has been destroyed and replaced by shrimp farms. This has accelerated the rate of erosion, and the lucrative shrimp farms are now being threatened by saltwater intrusion as a result of sea-level rise caused by erosion and excessive groundwater extraction to support Bangkok's population and industries. The Samut Sakhon area is of huge economic importance to the nation because of its diverse and productive fisheries, such as squid, shrimp farming, and fish-processing industries.

The impacts of relative sea-level rise are today highly visible, with electric poles submerged in water around Bang Khun Thien village. A nearby village, Ban Khun Samutchin, is a coastal erosion hotspot, where over the past 30 years erosion and land subsidence have decreased the shoreline by more than 1 km. The impacts of coastal erosion have not only led to the loss of physical infrastructure, such as roads, electricity systems, plus aquaculture facilities and farmland, but have also increased the vulnerability of villagers to storms and floods.

To curb or reduce the rate of coastal erosion, the national government and provincial authorities have invested in concrete walls and sandbags, but these investments have been costly and have had limited success. According to the figures available, 1 km of coastal erosion works using concrete poles costs B45 million, or about $1.4 million; and 1 km of sandbags is B36 million, or $1.125 million.

The local communities that had lost their land and livelihoods joined forces in a network, with assistance from the World Wide Fund for Nature and local NGOs, to try to tackle the erosion problem. Adapting traditional technology, bamboo fences/walls were constructed, supplemented by mangrove planting. Bamboo walls are natural, sustainable, and more cost effective. According to a Kok Kham community leader, 1 km of bamboo costs $250,000, compared with the $1.1–$1.4 million estimated costs for rock, concrete, or sandbag structures. Moreover, concerns about the potential environmental impact of soil leaching from the sandbags have also been raised.

The livelihoods of fishing communities such as Kok Kham are derived mainly from squid and fish processing. From 1993 to 2007, aquaculture farmers in Bang Khun Thien village invested a total of $117,420 to protect their farms against coastal erosion and flooding. On a per household basis, they spent more than 20% of their annual income on adaptation measures, e.g., in 2006, this amounted to $3,362 on average out of a total household income of $14,634 (Rawadee and Areeya 2008).

Action areas

The overall recommendation is that investment and management actions involving mangrove forests should follow the ecosystem-based approach, which considers mangroves to be an integral part of the coastal zone linked to other adjacent marine and freshwater/terrestrial ecosystems. Four main action areas have been identified below, with specific recommendations. They have been derived from lessons provided by the case studies described here, and from similar experiences gained during implementation of a large number of Mangroves for the Future projects in six countries of the Indian Ocean region (India, Indonesia, Maldives, Seychelles, Sri Lanka, and Thailand).

In considering these recommendations, reference should also be made to the 12 principles outlined on ecosystem approaches (Box 1). Although these are not necessarily important to every management decision or investment, they are a useful checklist, and the case studies illustrate the benefits of following some of these principles in practice.

1. Technical innovations

- Mangrove restoration and rehabilitation: the development of technically sound and fully costed models; and
- Engineering solutions for coastal protection (against storms, flooding, and erosion): combining hard (e.g., sea walls) and soft (e.g., mangroves) engineering.

Mangrove restoration/rehabilitation models, combined with other coastal protection measures, are needed, particularly in relation to mangroves and climate change adaptation.

2. New investment mechanisms

- Working systems and models for Payment for Ecosystem Services in coastal areas, including mangrove ecotourism; and
- Applying REDD and other carbon marketing mechanisms to mangrove forests.

Payment for Ecosystem Services mechanisms can benefit coastal communities by paying them to provide environmental services, but to date these mechanism have been limited mainly to payments for local people to plant and protect mangroves.

Mangrove ecotourism has shown good potential in several Asian countries, but investment and sustainable financing mechanisms, including benefit-sharing systems for local communities, are needed.

Several forest carbon marketing mechanisms have already been developed that potentially could be applied to mangroves if viable technical and financial carbon storage and marketing models could be developed.

3. Improved management approaches

- Community-based coastal area management plans: developing and upscaling these and seeking their endorsement by local authorities and national governments; and

- Comanagement models: developing and replicating successful examples.

A number of successful community-based management models are available, backed up by a great wealth of experience in working with coastal communities. These should be scaled up through national development programs and large projects. Comanagement models, whereby community involvement in mangrove resources management is linked to Payment for Ecosystem Services mechanisms, are also needed as the logical next step to combine management and investment in the coastal zone.

4. Knowledge gaps and research needs

- Integrated research combining environmental and economic studies to assess the carrying capacity of mangrove ecosystems for multiple, sustainable use, including new investment opportunities, e.g., mangrove ecotourism;
- Research into economic methodologies and studies to provide better economic valuations of the goods and services supplied by mangroves and the combined values of mangroves, coral reefs, and seagrasses as interrelated coastal ecosystems; and
- Study of approaches and best practices that can combine scientific and traditional/local knowledge more effectively to support coastal ecosystem management and sustainable resource use.

References

Aksornkoae, S. 1993. *Ecology and management of mangroves*. Bangkok: IUCN.

Costanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, and B. Hannon. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387:253–260.

Crona, B. I., and P. Ronnback. 2005. Utilization of replanted mangroves as nursery ground by shrimp communities in Gazi Bay, Kenya. *Estuarine, Coastal and Shelf Science* 65:535–544.

_____. 2007. Community structure and temporal variability of juvenile fish assemblages in natural and replanted mangroves, *Sonneratia alba* Sm., of Gazi Bay, Kenya. *Estuarine, Coastal and Shelf Science* 74:44–52.

Das, S. 2008. Economic valuation of a selected ecological function—storm protection: A case study of mangrove forest in Orissa. PhD diss., University of Delhi, India.

de Leon, T. O. D, and A. T. White. 1999. Mangrove rehabilitation in the Philippines. In *An international perspective on wetland rehabilitation*, ed. W. Streever, 37–42. The Netherlands: Kluwer Academic Publishers.

FAO (Food and Agriculture Organization). 1994. *Mangrove forest management guidelines*. FAO Forestry Paper No. 117. Rome.

Hirway, I., and S. Goswami. 2004. *Valuation of mangroves in Gujarat*. Ahmedabad, India: Centre for Development Alternatives.

Hogarth, P. 2007. *The biology of mangroves and sea grasses*. 2nd Edition. Oxford, UK: Oxford University Press.

Kappel, C. V. (lead author), R. G. Martone (contributing author), and J. E. Duffy (topic editor). 2006. Ecosystem-based management. In *Encyclopedia of Earth*, ed. C. J. Cleveland. Washington, DC: Environmental Information Coalition, National Council for Science and the Environment). http://www.eoearth.org/article/Ecosystem-based_management (accessed 9 November 2008).

Laffoley, D. d'A., and G. Grimsditch, eds. 2009. *The management of natural coastal carbon sinks*. Gland, Switzerland: IUCN.

Lewis, R. R. 2001. Mangrove restoration: Costs and benefits of successful ecological restoration. Proceedings of the Mangrove Valuation Workshop, Universiti Sains Malaysia, Penang, 4–8 April 2001. Beijer International Institute of Ecological Economics, Stockholm, Sweden.

Macintosh, D. J., and E. C. Ashton. 2002. *A review of mangrove biodiversity conservation and management*. Denmark: Centre for Tropical Ecosystems Research, University of Aarhus.

Millennium Ecosystem Assessment. 2005. Ecosystems and human wellbeing: Wetlands and water synthesis. Washington, DC: World Resources Institute.

Nellemann, C., E. Corcoran, C. M. Duarte, L. Valdes, C. DeYoung, L. Fonseca, and G. Grimsditch, eds. 2009. *Blue carbon: The role of healthy oceans in binding carbon; A rapid response assessment*. United Nations Environment Programme, GRID–Arendal, Norway.

Overton, J. L., and D. J. Macintosh. 2001. Successful mud crab farming in Thai Binh Province, *Viet Nam*. In *Utilizing different aquatic resources for livelihoods in Asia: A resource book*, 31–40. Canada: IDRC.

Polidoro, B. A., K. E. Carpenter, L. Collins, N. C. Duke, A. M. Ellison, et al. 2010. The loss of species: Mangrove extinction risk and geographical areas of global concern. *PLoS ONE* 5(4): e10095.doi:10.371/journal.pone.0010095.

Pongthanapanich, T. 2008. *An economic valuation of coastal ecosystems in Thailand: A review of case studies*. Bangkok : Mangroves for the Future.

Primavera, J. 2000. Philippine mangroves: Status, threats and sustainable development. International Workshop Asia–Pacific Cooperation, Research for Conservation of Mangroves, 26–30 March 2000, Okinawa, Japan.

Ramsar Convention Secretariat. 2006. *Handbook no. 1 for the wise use of wetlands*. 3rd edition. Gland, Switzerland.

Rawadee, J., and Areya. 2008. Adaptation strategies for coastal erosion/flooding: A case study of two communities in Ban Khun Thian District, Bangkok. *Thailand Development Research Institute Quarterly Review* 23 (1): 11–18.

Robertson A. I., and D. M. Alongi, eds. 1992. Tropical mangrove ecosystems. *Coastal and Estuarine Series* 41. Washington, DC: American Geophysical Union.

Robertson A. I., and S. J. M. Blaber. 1992. Plankton, epibenthos and fish communities. In Tropical mangrove ecosystems, ed. A. I. Robertson and D. M. Alongi. *Coastal and Estuarine Series* 41:173–224. Washington, DC: American Geophysical Union.

Ronnback, P. 1999. The ecological basis for the economic value of mangrove forests in seafood production. *Ecological Economics* 29:235–252.

Ronnback, P., B. Crona, and L. Ingwall. 2007. The return of ecosystem goods and services in replanted mangrove forests: Perspectives from local communities in Kenya. *Environmental Conservation* 34:313–324.

Saito, Y., N. Chaimanee, T. Jarupong, and J. Syvitski. 2007. Shrinking megadeltas in Asia: Sea-level rise and sediment reduction impacts from case study of the Chao Phraya Delta.

Sathirathai, S. 1998. Economic valuation of mangroves and the roles of local communities in conservation of natural resources: Case study of Surat Thani, South of Thailand. Research report submitted to the Economy and Environment Program for South East Asia (EEPSEA), Singapore.

Schmitt, K. 2009. *Management of natural resources in the coastal zone of Soc Trang Province: Protection and sustainable use of coastal wetlands through co-management and mangrove rehabilitation with emphasis on resilience to climate change*. Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ).

Secretariat of the Convention on Biological Diversity. 2004. *The ecosystem approach (CBD guidelines)*. Montreal.

Spalding, M. D., F. Blasco, and C. D. Field, eds. 1997. *World mangrove atlas*. Okinawa, Japan: The International Society for Mangrove Ecosystems.
UNEP (United Nations Environment Programme). 2009. *UNEP Year Book 2009*. Nairobi: Division of Early Warning and Assessment, UNEP.
UNEP–WCMC (United Nations Environment Programme–World Conservation Monitoring Centre). 2006. *In the front line: Shoreline protection and other ecosystem services from mangroves and coral reefs*. Cambridge, UK: UNEP–WCMC.
World Bank. 2007. *Thailand environment monitor, 2006*.

Securing sustainable livelihoods and environmental protection

Community forestry as a key strategy

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Policy innovations built on the community forestry model are producing tangible benefits across Asia and the Pacific to combat widespread deforestation while helping support grassroots communities.

The demand for food is forecast to double by 2050 as the population increases, affluence grows, and people's dietary choices change (FAO 2008). One of the keys to securing livelihoods lies in the sustainable use and management of natural resources (land, water, crops, grass, herbs, shrubs, trees, forests, animals, fish, etc.). Innovative approaches, such as community forestry (Box 1), are playing an important role in addressing the livelihood challenges—especially rural livelihoods—facing the Asia and Pacific region.

This paper examines the contributions that community forestry can make to sustainable livelihoods and environmental protection in Asia and the Pacific. After a brief overview of the issues facing people and forests in the region, it describes the ways in which forest tenure, access, and use pattern are changing as community forestry expands in the region. It provides examples of community forestry innovations and the ways they are contributing to sustainable livelihoods and environmental protection. The paper concludes with a reflection of lessons learned and suggestions for future action.

[1] Formerly called the Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC), The Center for People and Forests is a Bangkok-based international organization that works with the people of the Asia and Pacific region in developing community forestry and managing forest resources for optimum social, economic, and environmental benefits.

Box 1: Terminology

Food security refers to physical, social, and economic access by all people at all times to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO 2008).

Livelihoods, of which food security is a key element, are sustainable when they are resilient in the face of external shocks and stresses; they maintain the long-term productivity of the natural resource base; and they do not undermine the livelihoods of others or compromise the livelihood options open to others (Carney 1998).

Forest refers to "all resources that can produce forest products and captures woodland, scrubland, bush fallow, farm bush and trees on farms as well as forests" (Arnold 2001).

Forest communities refer to individual households, groups, and indigenous peoples that depend on forest resources for a living.

Different terms are used to describe modalities for engaging local communities in forestry. These include community forestry in Cambodia, Nepal, Thailand, and Viet Nam; joint forest management in India; village forestry in the Lao People's Democratic Republic; social forestry in Indonesia; and community-based forest management in the Philippines. Each of these terms has its own specific connotations, and considerable differences occur in their characterization, especially the level of authority and responsibility in forest-management decisions.

Community forestry is used in a generic sense to denote the many types of modality where forest people have a major role in forest-management decisions.

Issues facing the people and forests of the Asia and Pacific region

Poverty

Pressures on the region's forests have increased significantly in recent decades. High rates of population and economic growth, combined with rapid urbanization, continue to increase demand for forest products and agricultural land. At the same time, millions of rural people continue to live in and around forests, depending on them, wholly or in part, as a significant livelihood resource.

The region is home to some two-thirds of the developing world's 1.4 billion people living below the poverty line (less than $1.25 a day), with the majority living in rural areas and depending on forests to some degree. Furthermore, 70% of the world's indigenous and minority peoples—who are among the poorest of the poor—are located in Asia and the Pacific (Hall and Patrimos 2010), generally in the forested areas (Sunderlin 2005).

Isolation, inaccessibility, and social exclusion continue to make it difficult for forestry and other development programs to reach out to forest communities. Social exclusion "is mostly viewed as a direct consequence of poverty, both stemming from discrimination on the basis of race, ethnicity and gender, and unequal access to services" (UN–DESA 2009). Indigenous people, ethnic minority groups, and hill tribes in Southeast Asia, and scheduled tribes, scheduled castes, and the Dalits —a group in South Asia traditionally regarded as untouchable and who have been marginalized for generations—are all groups that have historically suffered social exclusion. Exclusion of women in some societies may be related to their marital, health, or employment status, as well as the social structure. Creating conditions that allow excluded women and men to demand change and influence the priorities of forest institutions is vital if forestry programs are to empower poorer forest-dependent people.

Forest resources

Some 734 million hectares (ha) of Asia and the Pacific were forested in 2005 (FAO 2010). The region as a whole continues to face widespread problems of deforestation and forest degradation. According to the Food and Agriculture Organization (FAO 2008), between 2000 and 2005, about 3.7 million ha was lost annually; the largest share, 42%, was lost between 1990 and 2000 through conversion to permanent agriculture. Forest loss is likely to continue in most countries, given continued rapid economic growth through industrialization, and with natural resources, including forests, remaining the main source of people's livelihoods.

Industrial production and consumption of round wood, sawn wood, wood-based panels, paper, and paperboard in 2005 were recorded at 546 and 607 million cubic meters, respectively, and these are all projected to rise, with the People's Republic of China (PRC) and India accounting for much of the growth. Net imports to the advanced industrialized economies such as Japan have declined, but those to PRC and India have increased greatly as a result of increases in domestic demand and declines in domestic supplies caused by logging bans (FAO 2010).

Forests make a significant contribution to the energy requirements of the region, with three-quarters of the wood produced in the region being burned as fuel (FAO 2010). In addition, the region's forests provide a range of other forest products, including food, medicines, fibers, gums, resins, cosmetics, and handicrafts. Most of these are used by rural households for subsistence (FAO 2010). Increasing demand has led to both intensive collection and rapid depletion of these products.

Environmental service functions of the forests remain a priority forestry agenda of the countries of Asia and the Pacific. Many countries have a long history of protected area management systems, and several governments have imposed logging or log export bans—although the control of illegal encroachment remains a challenge. Increasing water scarcity is affecting many countries' key sectors, including agriculture and industry, and has resulted in increased public allocations for watershed management (Dillaha et al. 2007, cited in FAO 2010). The climate

change–related forest initiatives, including reducing emissions from deforestation and degradation (REDD),[2] hold potential for helping to mitigate the adverse effects of climate change and to adapt to climate change.

Forest management

Perceptions of ways in which forest resources should or could be managed have changed over the last decades, partly because of the narrow focus of a pro-industrialization forestry model, and partly as a response to broader socioeconomic changes in the region, and in the world more generally. One demand for change comes from those who are concerned about the loss of forest biodiversity and for the need to maintain forest ecosystems. They emphasize the need to bring more forests under protected area systems (e.g., national parks, wildlife reserves, etc.). Some 50–70 million ha of the Asia and Pacific region's forests are recorded as being inside legally declared protected areas (FAO 2001, cited in Molner et al. 2004); however, in reality, much larger forest areas—both administered by government authorities and under community and indigenous people's ownership—are under some sort of protected area system (Molner et al. 2004).

Another direction is a shift in the control and management of forests from state authorities to local communities, using community forestry or similar models. This views forest people as central (rather than a threat) to the existence of forests, and a key to their sustainable use, management, and governance. Consequently, this has resulted in policy reforms, with a considerable portion of state- controlled forest designated for protection and management by local communities over the last two decades or so.

Meanwhile, the long-standing pro-industrialization model of forestry—which had taken a low profile during the 1990s—has resurfaced, as economic growth through industrialization and urban affluence have stimulated markets for forest products. Government forest administrations continue to provide licenses to private companies for logging in large tracts of the most productive and commercially important forest areas, including plantations. Although some firms take sustainable forest management seriously and employ good practices, such as reduced impact logging and forest certification, there are still many that severely degrade the forest.

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[2] In 2007, the Intergovernmental Panel on Climate Change concluded that reducing deforestation would have a large and rapid effect on reducing global carbon emissions. Emissions from deforestation in the late 1990s were estimated to be 5.8 gigatons of carbon dioxide per year, about 20% of the global total. The United Nations Framework Convention on Climate Change 13th Conference of the Parties in Bali, December 2007, then adopted the Bali Action Plan, which launched a formal process to support REDD. This has resulted in development of mechanisms, such as the United Nations–REDD, through which forests can be credited as carbon sinks and national governments can be provided with incentives to leave their forests intact.

Forest tenure and ownership

The Asia and Pacific region and the world more generally have been experiencing forest tenure[3] transitions involving a range of forest tenure models. According to a recent study (Sunderlin et al. 2008), community or private ownership of forests in 2008 was recorded at 182 million ha, which accounted for 27% of the total forest area. The forest area under private or collective household ownership is substantial in some countries, especially in Australia, PRC, Japan, Nepal, and Papua New Guinea, whereas in other countries, most forests remain under state control.

It is in this broad context of poverty, livelihood, and environment challenges that this paper attempts to analyze community forestry's contributions.

Innovative regulatory frameworks

Community forestry policy and law

Community forestry has become a major form of forestry in many countries, and is spreading rapidly in both the developing and developed world and tropical and temperate nations (Arnold 2001; Gilmour et al. 2005; Mcdermott and Schrekenberg 2009). In Asia and the Pacific, several national governments have revised their countries' forest policies with a provision for community forestry. Table 1 provides information on community forestry policies in selected Asian countries. Some 147 million ha of forests are under community and indigenous people's ownership. Similarly, some 25 million ha of state forests are designated for use by local and indigenous communities.

Forest use rights and benefits

Crucial elements of a community forestry regulatory framework include policy and law with secured tenure, use rights, and benefits. This should be backed up with field implementation guidelines and arrangement of appropriate institutions at the local and national levels. Frequently, one of the limiting factors is the gap between recognizing these important elements in a policy document and their realization in actual practice. It is in the realization and transformation aspects of the tenure, use rights, and benefits that community forestry has most to contribute to determining a forest-based livelihood strategy.

In practical terms, it is the forest users' constitution and site-specific management plan that help to transform the concept of use rights into reality. The

[3] Tenure systems define who can use what resources for how long and under what conditions (FAO 2002). Customary tenure systems are determined at the local level and are often based on oral agreements, whereas statutory tenure systems are applied by governments and are codified in law. This paper focuses mostly on statutory tenure, partly because it is the official view that shapes policy and its implementation and partly because it is possible to measure recent change, which in turn could have profound consequences for the ways different stakeholders may respond to changes and for the ways forest resources are used and managed.

Table 1: Selected Asian countries with community forestry regulatory frameworks

Country	Community Forestry (CF) Policy, Law, and Guidelines	People and Forest
Cambodia	2002: CF Policy; 2003: CF Law; 2005: Guidelines for Field Implementation Prakas	176 groups 143,789 ha
People's Republic of China	Mid-1980s: Collective forest reforms, allocation to households; 2003: No. 9 Policy allocates collective forests (not land) to households for use in many ways, including individual households, partnership, village cluster, contracts, and collectives; 2006: New Countryside Development Initiative	8 provinces: Allocation to households (69.1%), partnership (2.9%), cluster (5.5%), contract (4.5%)
India	1989: Joint forest management (JFM) to involve locals in state forests; amended forest act in 1991; 2008: Passed tribal (forest) act	JFM: 84,632 groups 17,331,955 million ha
Indonesia	1997: Hak Pengelolaan Hutan Kemasyarakatan License for communities to manage/use forests; 2003: Social Forestry (SF) regulations; 2007: HKM (community forestry); Ministry of Forestry (MoF) Regulation No. 37; 2014 target: 2 million ha; 2008: Hutan Desa (HD=Village Forest); MoF Regulation No. 49	158,000 ha leased out to communities 2009: HKM 200,000 ha 2000: HD 5,000 ha
Lao People's Democratic Republic	2005: 20-year national forest strategy with provision for village forestry; a law for nontimber forest products recognizes "customary use." Each household can extract up to 5 cubic meters of timber.	Pilot projects testing village forestry
Nepal	1976: CF in National Forest Plan; 1977: Forest Act 1961 amended to hand over forests to village councils; 1978: Introduced CF rules and regulations; 1987: National CF Workshop resolution to hand over forests to actual users; 1989: Master plan gave CF the highest priority; 1993: New forest act; 1995: Implementation guidelines	1.2 million ha (25% of total) and 14,000 forest user groups or 1.6 million households (35% of total)
Philippines	Early 1980s: SF programs; 1987: Forest stewardship certificates for communities; 1986: Amended constitution to facilitate the cancelation of timber license agreements (TLAs); only 13 TLAs remaining, covering 543,939 ha; 1995: Executive Order 263; 1997: Indigenous People's Rights Act	5,503 groups (690,687 households) 5.97 million ha
Thailand	Early 1980s: Government officially recognized CF as a way for sustainable forest management; 1997: National constitution recognizes people's "rights" to forests; CF bill pending in the parliament	5,300 villages (0.7%); 196,990 ha forests (1.16% of total).
Viet Nam	Mid-1990: Several SF/CF field projects; 2003: CF law with two types of CFs, namely (1) forests legally owned by communities, (2) forests owned by and managed by local communities.	2,348,000 ha 1,203 community groups

Sources: Adapted from Gilmour et al. (2005); Cambodia (Heng and Sokhun 2005), PRC (Xu et al. 2010), India (Saigal et al. 2005), Indonesia (Hindra 2005; Yurdi Yasmi, personal communication), Lao PDR (Phanthanousy and Sayakoummane 2005), Nepal (Kanel et al. 2005), Philippines (Pulhin et al. 2005), Thailand (Wichawutipong 2005), Viet Nam (Ngai et al. 2005, Poffenberger 2006).

forest users' constitution and management plan must specify what can be used and what cannot, by whom, when and how, as well as sanctions for breaching the rules. It is these types of legal documents that the forest users find to be the most empowering. Tables 2 and 3 provide information on bundles of forest use rights.

Table 2: Bundle of local people's rights to forests

Rights To—	Cambodia	PRC	India	Indonesia	Philippines	Nepal	Viet Nam
Own forest land	No	No	No	No	Yes	No	No
Own forests	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group or households	Group	Group	Group	Group	Group	Group	Group
Allocate to households	?	Yes	?	?	?	?	Yes
Sell products in market	?	Yes	Yes	Yes	Yes	Yes	Yes
Lease to outsider	No	Yes	No	No	No	No	No
Cash income	?	?	Vary	?	100	100%	?

Source: Y. Malla, personal communications with government officials responsible for implementing forestry policy.

Table 3: Rights to self-governance, management, and use of community forest in Nepal

Right to self-governance	Rights to forest management and utilization
• Can form a group and register as independent self-governing group. • Forest user boundaries based on the actual users, which can transcend administrative boundaries. • As long as the forest is well managed, the government forest authority will not interfere. • Can elect, select, or change executive committee. • Can form own forest use and protection rules. • Can amend the users' constitution any time.	• No limit to forest area or users' numbers for handover. • Can grow cash crops together with forests, and mortgage standing forest products for loans. • Can utilize income for any purpose, but 25% of the income must be spent on forest development and management. • Can fix prices, market forest products, and set up own forest enterprise. • Can seek support from any organization, and raise funds through different forestry and nonforest enterprises with no requirement to share with the government. • Can invest in any areas, persons, or development activities, and hire and fire own forest watchers.

Source: Adapted from Pokharel et al. (2008).

Impact of community forestry on livelihoods and environment

Among the agencies that have devised frameworks to guide sustainable rural livelihood development (Carney et al. 1999), the livelihoods framework of the United Kingdom's Department for International Development (DFID) has been widely accepted and is used here as an example for discussion. According to the framework, five forms of livelihood capital or assets are crucial:

- **Natural capital** including natural resources: land, water, crops, forests and trees, and fisheries
- **Financial capital** including financial resources in various forms such as savings, credit, regular remittances, pensions, and other various income opportunities
- **Physical capital** including basic infrastructure such as transport, shelter, water, energy, communications, schools, and health clinics, as well as the production equipment and means
- **Human capital** including knowledge, skills, ability to work, and health
- **Social capital** including social resources such as networks, membership in groups, relationships of trust, and access to wider institutions in society

These five types of capital operate in the context of vulnerability outside the concerned person's control. The most important contribution of the livelihood framework is the way it breaks down capital (or productive assets) into a number of distinctive capital types. Thus, natural resources such as forests can be an asset. But it is the way they interact and the transforming processes that are put in place that turn these types of capital into useful elements of a sustainable livelihood strategy (Fisher et al. 2005).

This section draws heavily on lessons from Nepal, where information on the impact of community forestry is readily available. Examples from other parts of the region, where available, are also included. In most countries, tangible benefits from community forestry have barely started to flow due to considerable lag time between the establishment of effective community forestry regimes and the commencement of their utilization.

Contribution to natural (environmental) capital

Comprehensive, nationwide information on forest conditions or environmental outcomes following the initiation of community forestry is yet to be available. Nevertheless, several specific case studies and general observations suggest that there have been improvements in forest conditions or natural/environmental capital. These include forest land use change and biodiversity enhancement through decreased incidence of forest fires, decreased illegal forest product harvesting, increased control of grazing, higher tree density in formerly degraded forestlands, increased species diversity, return of wild animals and birds, regeneration of important tree species, etc. (Dougill et al. 2001; Dangal 2002; Dev et al. 2003; Yadav et al. 2003, cited in Ojha et al. 2009).

In the Philippines' Alcoy community forest site in Cebu (Central Visayas), local communities were able to conserve valuable habitats of the endemic life found in the area, including 122 species of birds, 27 species of mammals, and 27 species of reptiles and amphibians (Fernandez et al. 2004, cited in Lasco and Pulhin 2006).

In Nepal, Gautam et al. (2003) analyzed land use changes in a watershed covering 15,335 ha, where a community forestry program had been implemented since the 1970s, by comparing satellite imagery from 1976, 1989, and 2000. The study found that the number of forest patches declined over time (from 395 in 1976 to 323 in 1989 to 175 in 2000), whereas the average patch area increased over the same period. This was attributed to the merger of previously isolated small forest patches as previously degraded areas were regenerated or replaced with plantations under the community forestry program. Indeed, whole hillsides had been reforested under community forestry plantations in many hill districts (Dangal 2002).

In Pred Nai village of Trat Province, Thailand, when a mangrove forest that provided livelihoods for several villagers was destroyed due to a logging concession, concerned community members successfully formed a group to stop commercial logging. Biodiversity (and seafood production) was enhanced significantly as a result of the rehabilitation and protection of the mangrove forest (Kaewmahanin et al. 2003, cited in Fisher et al. 2005). Similarly, in Cambodia, following the destruction of forests along the northeast shores of the Tonle Sap (Great Lake), local communities started to protect the flood forest. Today, the forest provides a critical habitat for 200 species of fish, many of which are endemic (Evans et al. 2004, cited in Poffenberger 2006).

In Nepal, community forestry has also enabled local communities to bear most forest protection and management costs. Some 30%–40% of the community forest income is reported to be reinvested in their forest resource maintenance and regeneration (Ojha et al. 2009). This is a complete turnaround from the situation of the 1980s, when almost all of the community forestry work was supported by outside agencies that funded field projects and employed forest watchers to protect forests (Gautam and Roach 1987).

Contribution to financial (cash and noncash) capital

Secure tenure and rights to forests mean guaranteed access to and availability of food. To many forest people, forests are the most significant means of livelihood. Yet, forest regulations have denied their rights to the forests. However, following the secured forest rights, these community members have become managers of

the resource. Well-managed community forests provide seasonal foods, particularly nutritious supplements to people's diets, as well as safety nets.[4]

Cash income generated from the sale of forest products and services can be used to purchase food. For example, in a food-deficit village of Oudomxay Province, Lao People's Democratic Republic, with support from an International Union for the Conservation of Nature and Natural Resources project, villagers were able to organize and market bamboo shoots, earning an average income per family of $130, which was four times more than the year before. In the context of the general household economy there, this income was very significant for the poor household (Foppes and Ketphanh 2000, cited in Gilmour et al. 2005).

In Nepal, community forestry is reported to have reached the stage where it now generates significant cash income. An assessment of 1,288 forest user groups (FUGs) from 12 hills and Terai (lowland) districts, with the result extrapolated to all FUGs in the country, indicated that the total annual cash income from the sale of forest products from community forests was NRs747 million or more than $10 million (Kanel and Niraula 2004). This was almost 42% of the annual budget of Nepal's Ministry of Forest and Soil Conservation. When the cash equivalent of forest products consumed by households for subsistence was added, the total annual income generated from community forestry was estimated at NRs1.8 billion or $24 million (Kanel and Niraula 2004).

FUGs are using funds to initiate credit schemes and community forest enterprises such as sawmills and other forest product processing industries. In DFID-supported livelihoods and forest program districts, some 426 FUGs have initiated credit schemes (revolving funds) involving over 8,000 households (N. Chapagain and Banjade 2009). In Parbat District, west Nepal, 312 FUGs implemented savings and credit schemes through which they mobilized more than NRs5.8 million or $74,935 (Luintel and Timsina 2008). As a result, forest users are able to sell processed goods at a much higher price in the market and at the same time generate employment opportunities within the villages (Singh 2005). All this indicates a big shift from the situation in the early 1990s, when selling forest products from community forests was not permitted (Malla 1993).

Over the years, Nepal's community forestry has also received much criticism concerning local elites that dominate the process and capture most benefits. For example, in the study by Kanel and Niraula (2004), only 3% of the NRs747 million ($10 million) was targeted toward specific pro-poor activities. Consequently, the 2004 national community forestry workshop passed a resolution to allocate at least 25% of the community forestry income for supporting the poorer households.

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[4] In some societies, such as parts of Bangladesh, India, and Nepal, forests are integral parts of the agricultural production systems. Leaves and twigs from the forest are used as fodder and bedding materials for farm animals. The mix of animal dung and used bedding materials in turn then serves as a very important source of fertilizer to produce food crops. This forest–livestock–agriculture linkage is critical in the rural mountainous areas, where chemical fertilizers are not easily available, or where it is available but the prices are too high.

More recently, there has been mounting evidence of the poorest household members gaining more from community forestry work (B. Chapagain et al. 2009; Bhattarai 2009; Pokharel and Carter 2010). More FUGs are reported to have set aside an increasing portion of the community forestry income to support the activities of poorer households. For example, in 2007–2008, NRs14.4 million ($193,550) or 18% of the total income generated by 4,500 groups in 15 Livelihood and Forestry Programme districts were allocated for poverty reduction–related activities (B. Chapagain et al. 2009).

Many FUGs now have specific provisions to support Dalit men, women, and children and conflict-affected households—with increased access to opportunities for paid employment, supply of forest products free or at a subsidized rate, scholarships, interest-free loans for initiating income-generating activities, etc. An assessment of 110 FUGs of Dolakha, Ramechhap, and Okhaldhunga districts sums up the general outcome of Nepal's recent emphasis on a more pro-poor community forestry program. With no specific provision for poorer households in 2000, by 2008, FUGs that had provisions had increased by up to nine times (Pokharel and Carter 2010). Grants provided to poorer households increased from none in 2000 to NRs17,000 in 2006 and to NRs149,000 in 2008; soft loans from none in 2000 to NRs174,000 in 2006 and to NRs506,000 in 2008; timber from none in 2000 to 3,233 cubic feet in 2006 and to 6,096 cubic feet in 2008; scholarships from none in 2000 to 14 in 2006 and to 154 in 2008; and jobs from none in 2000 to 174 in 2006 and to 209 in 2008 (Pokharel and Carter 2010).

Nevertheless, more can still be done to understand complete community forestry economies within and between households and communities in order to encourage policy changes that lead to a more equitable distribution of benefits.

Contribution to physical capital

Following the community forestry program, a range of village development activities, such as schools; village roads; and schemes for irrigation, drinking water, and electricity, were reported to have been funded using community forestry income. No doubt, the FUG members see these as very important for enhancing their livelihoods. Moreover, the presence of these physical facilities, funded from their own community forestry fund, gives villagers confidence, raising the value and importance of the forests.

Investment in physical infrastructure has been beneficial to both rich and poor households in terms of financial capital. According to N. Chapagain and Banjade (2009), 167 FUGs spent part of their income on supporting drinking water schemes, and 68% of the 12,480 households were from the poor household categories. Similarly, 41 FUGs used some of their income for irrigation schemes involving 7,217 households, and 65% of these represented poor household groups.

Contribution to human capital

Community forestry seems to make significant contributions to human capital formation in a number of ways. Generally, most community forestry programs tend to have provisions for capacity building of their own staff and community members. In addition, support to literacy classes and provision of scholarships for children's education will go a long way to build the capacity of poorer household members. Similarly, creating forestry and nonforestry jobs within the village provides opportunities for developing diverse skills. And, the increased effort toward making the program more pro-poor and gender sensitive is definitely a step in the right direction for promoting equitable development.

However, a more important contribution relates to the way in which community forestry has helped to mobilize and strengthen capacities of the millions of men and women in the grassroots for forest resource management. For example, today, Nepal's community forestry program has over 14,000 FUGs (involving 9 million people—one-third of the country's total population) and at least 140,000 committee members (assuming at least 10 members per committee) actively protecting and managing forest resources across the country. Similarly, in India, 84,632 actively operating forest committees mean that there are at least 846,320 members. These represent some 15 and 8 times more than the entire government forestry staff in Nepal and India, respectively.

These committee members meet regularly, visit their forests, and review their forest situations. Each FUG has a general assembly at least once a year and makes important decisions. In the case of Nepal, assuming that an FUG holds one general assembly a year, it would mean about 8 million people taking part in the general assemblies. And supposing that an FUG committee meets once in 3 months and for an average of 2 hours each, it would mean about 1,120,000 person-hours of committee members, each year, devoted to forest management work. As the committee members gain experience, they become more skilled and efficient at handling management and governance issues facing their community forests.

Contribution to social capital

Social capital building is yet another major part of community forestry contributions. Community forestry helps bring different groups and individuals together, making them a reasonably cohesive entity. It is critical to recognize that, although responsibility and authority are actually vested in the group, the group is made up of different interest groups and people—women, men, children, young and old, with varied means and sources of livelihoods. Each of these interest groups or individuals views the forest from the perspective of their own specific interest. However, the way these varied interests are addressed and managed is fundamental to the success or failure of community forestry programs. Within the group, a common understanding of the process for decision making is important; so is the need to clarify roles, responsibilities, and authorities of concerned stakeholders, including forest users and their representatives.

Increasingly, more women, Dalits, and ethnic people are being elected as members of forest committees. In Nepal, for example, an analysis of the composition of 11 FUGs by Luintel and Timsina (2008) revealed that over time, the ratio of women to men changed from 15:77 to 24:80, and then to 43:68. Similarly, between 2003 and 2008, the overall representation of Dalits increased from 6% to 12%; that of ethnic minorities, from 32 to 44%; and that of women, from 21% to 36%.

Community forestry's contribution to social capital formation can be further judged by the ways it has helped develop the network of forest users within and outside the country, thereby building solidarity to safeguard their use rights to forests and other general interests. The Federation of Community Forest Users of Nepal (FECOFUN), the Community Forestry Assembly in Thailand, and the Forest Users Association of India are just a few of the many examples. Furthermore, recent moves toward forming a global level association to gain wider support for community forestry have resulted in the formation of a global alliance for community forestry, with Nepal's FECOFUN serving as a focal institution for Asia.

Contributions to broader development objectives

Community forestry has also proved to be one of the rare innovations that translate into actions regarding many of the recently emerging general social development concepts and processes, including rural development, decentralization and devolution, people's participation, and governance systems. It has contributed to rural social processes of change by its different ways of doing things and by treating rural forest people as the real agents of change. It is able to contribute toward diversifying livelihood opportunities and helping to address a host of rural–urban issues, including the widening rural–urban gulf and rural outmigration.

With authority and control over forests, local community members are able to effectively protect and regenerate the resource and to keep powerful outside interest groups out of their resource. As to the concept of "people's participation," community forestry has helped to develop, together with the forest people, a range of participatory techniques. Some of these are reported to be equally relevant for other sectors. On forest governance, community forestry has led to the development of local decision-making systems that are open, transparent, and accountable. Systems such as making decisions at the forest user assembly; provision for committee members to represent women, ethnic minorities, and Dalits; and public auditing to avoid misuse of community forestry income are all signs of good governance.

Lessons learned and future actions

Community forestry has proved to be a most innovative and practical strategy that has emerged in the natural resource sector over the last three decades. If

properly planned and executed, community forestry programs can reach poorer people in remote and isolated rural areas and improve the livelihood of the poor, including Dalits and ethnic minority groups, that are still being neglected. One of the main drivers of community forestry's innovation and dynamism lies in its innate flexibility and an action–research–learning approach that allows constant innovation and adjustment as this strategy develops.

There are still areas where improvements are needed in terms of planning and monitoring actual livelihood outcomes and ways for reaching individual households within an FUG and individual members within a household. The following actions should be considered:

- A legal community forestry policy and regulatory framework, with secured tenure and use rights, must be supported by a simple field implementation guideline and appropriate institutional arrangement. It is a simple management plan—with defined forest and user boundaries and simple forest management rules—that will transform the tenure and use rights and that the forest people can relate to and implement easily.
- Local communities must not be tangled in red tape with complicated procedures and high transaction costs. As Gilmour et al. (2005) explain, community forestry policy should be *enabling* rather than *enforcing*. It should enable rural communities to improve their own livelihoods and the condition of the forests in their vicinity by removing any constraints. Government agencies should adopt a supportive and facilitative role to assist communities in this effort.
- There is a need for a more explicit strategy and guide to ensure that the poorer household members' interests are considered within each FUG right at the beginning of the management planning. This includes setting clear targets and processes to execute, as well as monitoring implementation and outcomes. For example, community forestry should be allowed in both existing productive forests and degraded forest land so that the people below the poverty line start to get benefits reasonably quickly, without having to wait for the land to be rehabilitated with trees.
- Community forestry development requires support at the initial stages, especially when working with deforested lands or degraded forests. Some countries that have introduced community forestry more recently seriously lack the necessary expertise and skills required for capturing the new approach to forestry and to transform it into action. Countries with advanced community forestry will also need support to deal with second and third generation issues—especially those relating to the equitable sharing of the benefits and ways to enhance the management and use of forest resources as productive natural resource capital.
- Finally, some recent climate change–related forest initiatives, such as payment for environmental services, clean development mechanisms, and REDD—although important—are likely to be successful if they build on,

rather than conflict with, the interest of local communities living in and around forests and that depend on the resource for livelihood.

References

Arnold, J. E. M. 2001. *Forests and people: 25 years of community forestry*. Rome: Food and Agriculture Organization (FAO).

Bampton, J., and B. Cammaert. 2006. How can timber rents better contribute to poverty reduction through community forestry in the Terai region of Nepal? In *Cut for the poor. managing forests for poverty reduction*, ed. R. Oberndorf, P. Durst, S. Mahanty, K. Burslem, and R. A. Suzuki. Ho Chi Minh City, Viet Nam, 3–6 October 2006. FAO–RAP publication number 2007/09 and RECOFTC Report No. 19, Bangkok

Bhattarai, B. 2009. *Towards pro-poor institutions. Exclusive rights to the poor groups in community forestry management*. Discussion paper. Kathmandu: ForestAction.

Carney, D. 1998. Implementing the sustainable rural livelihoods approach. In *DFID sustainable rural livelihoods: What contribution can we make?*, ed. D. Carney. *London:* Department for International Development (DFID), United Kingdom (UK).

Carney, D., M. Drinkwater, T. Rusinow, K. Neefjes, S. Wanmali, and N. Singh. 1999. *Livelihoods approaches compared; A brief comparison of the livelihoods approaches of the UK Department for International Development (DFID), CARE, Oxfam and the United Nations Development Programme*. UK: DFID.

Chapagain, B., R. Subedi, and B. Rana. 2009. *Beyond elite capture: Community forestry contributes to pro-poor livelihoods in Nepal*. Discussion paper (Draft). LFP, Kathmandu.

Chapagain, N., and M. R. Banjade. 2009. *Community forestry as an effective institutional platform for local development: Experience from the Koshi Hills*. Kathmandu, Nepal: ForestAction.

Dangal, S. 2002. Forests generating employment and income. *Today Magazine*, Vol. 20.

Dev, O. P., N. P. Yadav, O. Springate-Baginski, and J. Sousan. 2003. Impact of community forestry on livelihoods in the Middle Hills of Nepal. *Journal of Forest and Livelihood* 3:64–77.

Dougill, A. J., J. Soussan, E. Kiff, O. Springate-Baginski, N. P. Yadav, O. P. Dev, and A. P. Hurford. 2001. Impact of community forestry on farming systems sustainability in the Middle Hills of Nepal. *Land Degradation & Development* 12:261–276

FAO (Food and Agriculture Organization). 2002. Land tenure and rural development. *FAO Land Tenure Studies 3*. Rome.

_____. 2008. *The state of food insecurity in the world 2008: High food prices and food security—threats and opportunities*. Rome.

_____. 2010. *Global forest resources assessment. 2010*. FAO Forestry Paper 163, Rome.

Fernandez Jr., R. F., M. Ang-Lopez, and G. Defiesta. 2004. KMYLB and key factors in CBForM Resilience in Brgy. Nugas, Alcoy, Cebu, Philippines. Department of Environment and Natural Resources–Forest Management Bureau. Manila: DENR.

Fisher, R. J., S. Maginnis, W. J. Jackson, E. Barrow, and J. Jeanrenaud. 2005. Poverty and conservation: Landscapes, people and power. *Landscapes and Livelihoods Series No. 2*. IUCN Forest.

Gautam, A. P., E. L. Webb, G. P. Shivakoti, and M. A. Zoebisch. 2003. Land use dynamic and landscape pattern change in a mountain watershed in Nepal. *Agriculture, Ecosystems and Environment* 99 (1–3): 83.

Gautam, K. H., and N. Roche. 1987. The cost of forest watchers: Implications for community forestry policy. *Banko Janakari* 1 (4).

Gilmour, D., N. O'Brien, and M. Nurse. 2005. Overview of regulatory frameworks for community forestry in Asia. First regional community forestry forum: Regulatory frameworks for community forestry in Asia. Bangkok: RECOFTC.

Hall, G., and H. A. Patrimos, eds. 2010. Introduction. In Indigenous peoples, poverty and development. Draft. World Bank.

Heng, S., and T. Sokhun. 2005. Cambodia community forestry 2005. First regional community forestry forum: Regulatory framework for community forestry in Asia. Bangkok: RECOFTC.

Hindra, B. 2005. Indonesia community forestry 2005. First regional community forestry forum: Regulatory framework for community forestry in Asia. Bangkok: RECOFTC.

Kanel, K., and D. Niraula. 2004. Can rural livelihoods be improved in Nepal through community forestry? *Banko Janakaari* 14 (1).

Kanel, K. R., R. P. Paudel, and J. C. Baral. 2005. *Nepal community forestry 2005*. First regional community forestry forum: Regulatory framework for community forestry in Asia. Bangkok: RECOFTC.

Lasco, R. D., and J. M. Pulhin. 2006. Environment impact of community-based forest management in the Philippines. *International Journal Environment and Sustainable development* 5 (1): 46

Luintel, H., and N. Timsina. 2008. *Is decentralization effective in empowering women?* Kathmandu: Forest Action.

Malla, Y. B. 1993. Market: An ignored dimension of community forestry. *Banko Janakari* 4.

Malla, Y. 2010. Personal communications with government officials responsible for implementing forestry policy in Asia and the Pacific.

Mcdermott, M. H., and K. Schrekenberg. 2009. Equity in community forestry: Insights from North and South. *The International Forestry Review* 11 (2).

Molner, A., S. J. Scherr, and A. Khare. 2004. *Who conserves the world's forests? A new assessment of conservation and investment trends*. Washington, DC: Forest Trends and Eco-agriculture Partners.

Ngai, N. B., N. H. Quan, and E. Kuester. 2005. *Vietnam community forestry 2005*. First regional community forestry forum: Regulatory framework for community forestry in Asia. Bangkok: RECOFTC.

Ojha, H., L. Persha, and A. Chhatre. 2009. *Community forestry in Nepal: A policy innovation for local livelihood and food security*. IFRI Working Paper No. W091–02. Ann Arbor, MI: International Forestry Resources and Institutions Program.

Phanthanousy, B., and S. Sayakoummane. 2005. *Lao PDR community forestry in production forests in 2005*. First regional community forestry forum: Regulatory framework for community forestry in Asia. Bangkok: RECOFTC.

Poffenberger, M. 2006. People in the forests: Community forestry experiences from Southeast Asia. *International Journal of Environment and Sustainable Development* 5 (1): 57–69.

Pokharel, B., and J. Carter. 2010. Addressing poverty and promoting good governance: Community forestry in post conflict Nepal. In *The Remake of a State: Post-Conflict Challenges and State Building in Nepal*, ed. B. R. Upreti, B. R. Sharma, K. N. Pyakuryal and S. Ghimire. Kathmandu: Heidel Press Pvt. Ltd.

Pokharel, B., P. Branney, M. Nurse, and Y. Malla. 2008. Community forestry: Conserving forests, sustaining livelihoods, strengthening democracy, 8–19. *Journal of Forest and Livelihood*.

Pulhin, J. M., M. C. Amaro Jr., and D. Bacalla. 2005. *Philippines community-based forest management 2005*. First regional community forestry forum: Regulatory framework for community forestry in Asia. Bangkok: RECOFTC.

Saigal, S., K. Mitra, and P. Lal. 2005. Empowering the forest dependent poor in India. In *Forests in landscapes: Ecosystem approaches to sustainability*, ed. J. Sayer and S. Maginnis. London: Earthscan.

Singh, H. 2005. Chaubas-Bhumlu community sawmill: Empowering local people. In *In search of excellence: exemplary forest management in Asia and the Pacific*, ed. P. Durst, D. Brown, H. D. Tacio and M. Ishikawa. Bangkok: FAO–RAP and RECOFTC.

Sunderlin, W. D. 2005. Livelihoods, forests and conservation: Editorial introduction. *World Development* 33 (9): 1379–1382.

Sunderlin, W. D., J. Hatcher, and M. Liddle. 2008. From exclusion to ownership? Challenges and opportunities in advancing forest tenure rights. Washington, DC: The Rights and Resources Initiative.

UN–DESA (United Nations Department for Economic and Social Affairs). 2009. *Rethinking poverty: Report on the world social situation 2010*. New York: United Nations.

Wichawuntipong, J. 2005. *Thailand community forestry 2005*. First regional community forestry forum: Regulatory framework for community forestry in Asia. Bangkok: RECOFTC.

Xu, J., A. White, and U. Lele. 2010. *China's forest tenure reforms: Impacts and implications for choices, conservation, and climate change*. Washington, DC: The Rights and Resources Initiative.

Connecting environment and food security

Traversed by seas and waterways, Asia and the Pacific has the largest number of fisherfolk in the world and a population that relies heavily on fish for food. Equally important to the region is the variety of crops that are at the heart of agricultural production. This section makes the case for ensuring sustainable fisheries and healthy plant life as key aspects of food security. These are the highlights of the Investment Forum's brown bag seminar on food security and the environment on 8 July 2010, sponsored by ADB's Agriculture, Rural Development, and Food Security Unit and Environment Community of Practice.

Sustainable fisheries management

"Sustainable fisheries management is a key aspect of food security," says Timothy Geer, Director for Government and Aid Relations, World Wildlife Fund International.

Globally, fish stocks are in a state of full exploitation and even overexploitation. In Asia, fish biomass has declined steeply since the 1960s. This has created a considerable risk of food insecurity due to the convergence of having the highest number of people living in poverty, the largest number of subsistence and artisanal fisherfolk in the world, and a higher per capita reliance on fish as a primary source of protein.

Effective fishery management relies on better valuation of fishery resources and improved monitoring, control, and surveillance of fishing operations. One successful tool to achieve this is a certification system based on rigorous environment standards and partnerships that include the seafood industry, government, and civil society. Experience shows that certification helps promote food security and secures livelihoods by ensuring that fishery resources are harvested responsibly. It also addresses habitat and environmental management concerns to achieve long-term resource sustainability. Such responsible management can lead to more connected, productive, and resilient fisheries.

The most prominent of these certification systems is the Marine Stewardship Council (MSC). The range of MSC-certified products available internationally is

Ecolabel of the Marine Stewardship Council.

growing exponentially, both worldwide and in Asia. Worldwide, 71 fisheries hold MSC certification, 129 fisheries are under full assessment, and 4,836 products on sale carry the MSC ecolabel.

In the Asia and Pacific region, certified fisheries can be found in Australia, Japan, New Zealand, and Viet Nam. More fisheries are currently under assessment, including major ones in the Maldives and the western central Pacific. One of the most recent and most important growth areas for MSC in Asia is in the number of tuna fisheries seeking certification. The Asia and Pacific region holds the world's largest share of tuna at approximately 65% of the total global volume, with the majority of the catch being consumed outside the region.

Within the region, the combined "wealth" of the tuna resource is most significant in the waters of small Pacific island nations, which have both great income dependency on and special responsibility to manage these fisheries better. These countries are now working with business-focused initiatives such as through the innovative company "Sustunable" and the MSC certification program to greatly enhance the sustainable management of their tuna, with the anticipated benefits of better food security and improved, sustainable economic development.

Why ensuring plant health is important

"We need to lose less of what we produce to improve productivity," says Dennis Rangi, Executive Director for International Development, Centre for Agricultural Bioscience International (CABI).

He adds that it is unfortunate that plant health is often ignored despite the growing problems of plant pests and diseases. "Crop pests and diseases are a major factor in low productivity. We need to promote plant health and increase spending on agriculture to ensure food security."

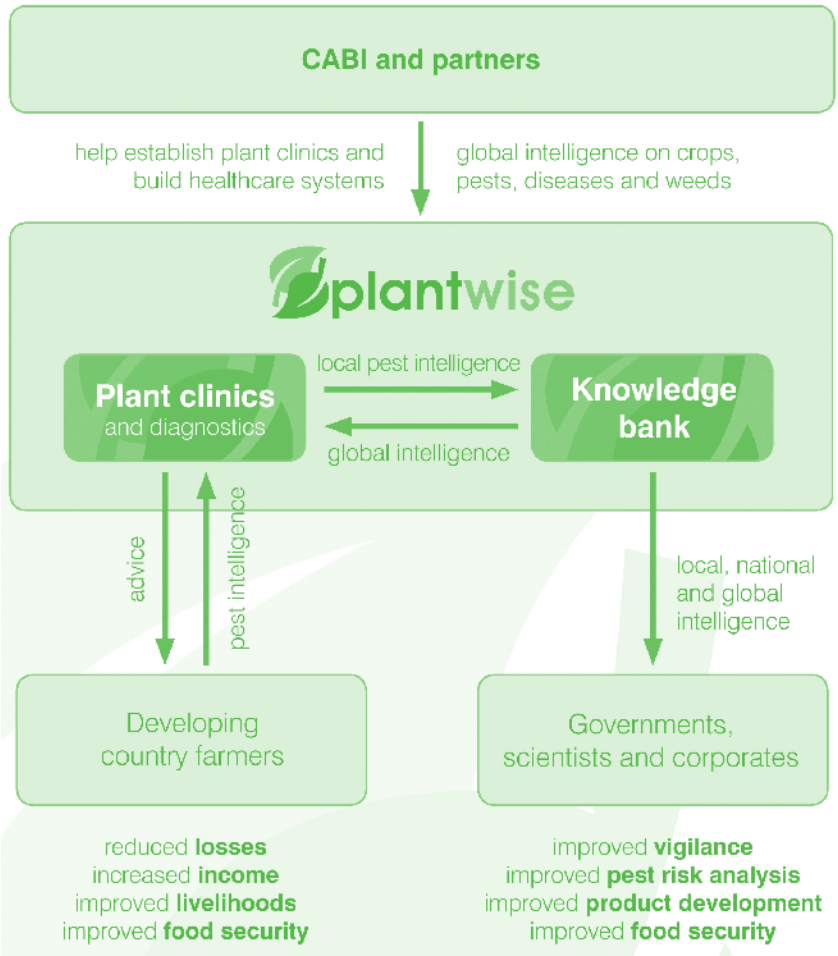
Rangi explains that smallholder farmers in the tropics are estimated to lose 30%–40% of their produce to pests and diseases. New and reemergent pests and diseases in Asia, such as golden apple snail, diamondback moth, cocoa podborer, papaya ringspot, and potato blight, conspire to inflict major damage. Climate change is expected to have a major impact on the distribution of plant pests and diseases that will threaten food security, especially as, unlike in developed countries, systems of vigilance among farming communities do not currently exist.

Emerging pests impact negatively on national food security and the livelihoods of smallholder farmers. These also present difficulties in complying with strict plant health and safety measures, hampering economic development through agricultural trade. Access to lucrative overseas markets is dependent on provision of evidence

to prove compliance with the measures set by the World Trade Organization and a country's capacity to manage agricultural pests and diseases.

According to Rangi, CABI is exploring an innovative solution through its Plantwise initiative (Figure 1), which seeks to integrate two key elements: (1) establishment of national plant health systems in developing countries, and (2) establishment of a global knowledge bank on plant pests and diseases.

Figure 1: How Plantwise works



Plant health systems are based on "plant clinics" run by national and grassroots organizations in markets and other areas that are central in farming communities. Plant doctors are trained by CABI to deal with any crop and any problem and give locally suitable recommendations, backstopped by reliable sources of technical expertise, agrodealers, and diagnostic laboratories to assist in diagnosing complex problems and finding the best solutions.

When problems cannot be resolved nationally, CABI and partner laboratories in the United Kingdom will provide expert diagnostic and advisory services. At the same time, clinics maintain vigilance through a systematic recording of types of problems and advice provided. Clinic records are a unique source of information on the changing status of plant health issues in rural areas where they take place.

Systems develop in different ways according to local context, but successes have already been observed in Bangladesh, Bolivia, Democratic Republic of Congo, India, Nepal, Nicaragua, Sierra Leone, Uganda, and Viet Nam. In Bangladesh, for example, a study of 350 clinic clients showed that farmers decreased costs of production by around 13% and increased gross benefits per hectare by around 37% when recommendations were followed.

The Plantwise knowledge bank, on the other hand, offers easy, consolidated access to the knowledge and resources of an alliance of national and regional organizations. CABI is exploring with countries how validated field data from rural plant clinics can contribute to the population of dynamic global pest distribution maps. Free access to public good information resources will be underwritten by paid-for services wherein CABI adds value to raw data through analysis and consultancy.

The knowledge bank will begin to log and track the distribution of pests and diseases over time. Users will be able to use these data to anticipate the future occurrence and movements of plant pests and diseases and feed this information into planning and resourcing decisions. Extension workers can utilize the pest-alerting capabilities to ensure that farmers are vigilant against emerging threats and get treatment advice from the knowledge bank's library of datasheets.

Chapter 7

Building resilience against vulnerability

Because of climate change, the Asia and Pacific region, like the rest of the world, is expected to become warmer and weather disturbances will become more frequent and intense. In addition to these geophysical challenges, the region is vulnerable to economic upheavals that can severely impact the vulnerable agriculture and food sectors. The good news, however, is the emergence of new technologies, policies, and institutions to help address climate change and other geophysical and economic shocks. These innovations are featured in the presentations of Session 4, organized by the Food and Agriculture Organization in the Investment Forum.

A panacea?

Agricultural insurance

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The acid test of an insurance program, as a complement to other risk management measures, ultimately depends on the cost–benefit ratio—to the farmer and to the potential insurance provider.

Disasters hit hard. Adverse weather events such as drought, excessive rains, storms, and hurricanes cause heavy losses to farmers. So do pests and animal diseases. Small-scale farmers with few assets have very limited means to compensate for losses and therefore normally suffer the most from disasters. Disasters often cannot be prevented from happening, but, to some extent, they can be predicted and arrangements can be made to reduce their impact. However, some disasters cannot be predicted, and farmers will have to cope with the losses.

Weather and similar risks belong to the category "nonmarket-related risks," while "market-related risks" refer to uncertainties about the prices producers will receive for commodities or the prices they must pay for inputs, etc. To manage risk means to take care to maintain income and to avoid or reduce loss or damage to property when undesirable events occur. Two options are available to the farmer for managing nonmarket-related risks. The first is to reduce as much as possible the actual exposure to the risk. For certain types of weather events, such as storms, this can mean building stronger wind shelters. For animal diseases, it could mean vaccinating livestock. The second option is to develop the means to cope with the effects of risk. An example is building up reserves of some kind, normally accumulating savings or saleable assets that the farmer can tap into. Another example is buying a crop and agricultural insurance policy that pays an indemnity if the crop is lost. Farmers normally apply a combination of these two options.

Agricultural insurance has gained increased attention in recent years as a tool for managing the risks associated with farming. Many pilot programs have been developed that target, in particular, small-scale farmers in developing countries who do not have access to such insurance.

Issues and challenges

Scope and nature of insurance

Insurance is a financial product that pools risk by collecting relatively small premiums from a large population and funding relatively large payouts to the small portion of that population that suffers losses from a specified risky event. Agricultural and crop insurance is geared to covering losses from adverse weather and similar events beyond the control of farmers. Agricultural insurance is not limited to crop insurance; it also applies to livestock, forestry, aquaculture, etc.

Basic to an understanding of how insurance works is the reality that insurance neither eliminates risk nor can it directly increase a farmer's income. Insurance only helps manage risks to the farmer's income, and spreads risk across the farming industry, the economy, or (in the case of international reinsurance), the international sphere.

The scope for effective and economic agricultural insurance can and often does change over time. Farming enterprises and systems are dynamic. As they change, they present different and new patterns of risk and new ways by which farming technology and farm management techniques can cope with production and other risks. To respond to the changing environment, the design of insurance solutions must be equally dynamic and tied to research and development. An insurer must at any time be able to establish the link between a loss that is insurable and the cause of that loss.

Limitations of insurance

Agricultural insurance is not the universal solution to the risks and uncertainties that farmers face. Rather, insurance can address part of the losses resulting from some perils. Further, no single universal insurance product meets all the demands of farmers. Each insurance product is suitable for a certain set of conditions. Assessing the suitability of a given insurance product, e.g., single-peril or multiple-peril insurance, means considering, among other things, the production system, farm size, type of asset to be covered, key peril or perils to which the farmer is exposed, risk location, and data availability and accuracy.

The cause-and-effect relationships in agriculture are not always readily observable and many variables affect agricultural production, not all of which are insurable. Agricultural insurance is an important component of risk management, but it does not replace good on-farm risk management techniques, sound production methods, and investments in technology. When coupled with these factors, agricultural insurance may indeed prove to be efficient for enhancing the well-being of farmers and the security of agricultural production.

Insurance cost

Insurance is a business. It is sold and bought in a market. As in any business arrangement, both sides of the transaction must expect to benefit. The farmer must

perceive that the premiums and expected benefits offer value, and the insurer must see opportunity for a positive actuarial outcome over time and for profit.

Insurance companies have to collect significant amounts of data on climate, production conditions, yield distributions, prices, etc., to be able to develop models for determining probable farming losses and for establishing premium and indemnity levels. In addition to meeting the cost of paying indemnities, premiums must cover several other costs, such as office premises, staff, equipment, and running costs, as well as costs associated with the acquisition of clients, e.g., advertising, farmer education, etc. As with other types of financial services, such as credits and loans, the more dispersed the client base, the more heterogeneous the farm production systems, and the smaller the insured value, the higher the administrative costs become. In the context of developing countries, where farms tend to be small, data tend to be unreliable and difficult to obtain in a timely manner, and infrastructure such as roads and telecommunications in the rural areas are poor, the administrative costs can easily escalate. High costs translate into high premium levels, which normally makes insurance unaffordable for the majority of small-scale farmers.

Potential

Agricultural insurance is an expanding business. This growth is driven by the increasing commercialization of agriculture and the growing underlying value of agricultural production. The increase in value of agricultural assets, which has heightened the sensitivity of participants in the agricultural value chain to loss, has also raised the demand for insurance. International trade policy developments and the availability of new types of insurance products are other factors that have contributed to a renewed and accentuated interest in crop and agricultural insurance.

The classic crop insurance products account for by far the bulk of all crop insurance written globally. The two main types of classic crop insurance are damage- or indemnity-based and yield-based products. Damage-based insurance is predicated on a measure of the actual loss incurred by the policyholder, often caused by single perils such as fire, hail, windstorm, or frost. Yield-based insurance, often called "multiperil" or all-risk inclusive insurance, provides cover against all perils that affect production (unless specific risks are explicitly excluded in the contract). Yield-based insurance is thus geared to a level of expected yield, rather than to the damage that is measured after a defined loss event.

Insurance today: The global picture

Crop insurance is primarily a business that serves farmers in developed countries; only a minor percentage of global premiums are paid in the developing world. The bulk of the premiums are written in the United States and Canada, which comprise approximately 62% of the market. This is followed by Asia with 18% and Europe with 16%. The balance comprises 2% in Latin America and 1% each in

Oceania and Africa. In developing countries, insurance is available mainly to larger and wealthier farmers. Although the entry of new insurance products that are more suited to developing country farmers may change the current geographical representation, small-scale farmers are most likely to remain excluded from the mainstream.

Most of the insurance programs that have not proved durable were set up on the basis of unrealistic expectations.

Innovations

Two fairly new insurance products that have caught a lot of attention are (1) products based on insuring a level of crop revenue, and (2) products for which insurable damage is determined on the basis of an index derived from data external to the insured farm itself.

Crop revenue insurance

Revenue insurance products protect insured parties from the consequences of low yields, low prices, or a combination of both. The essence of crop revenue insurance products is to combine production and price risk—production and price being the determinants of gross revenue from a given crop. Under normal supply-and-demand conditions, a production shortfall might be expected to result in a rise in price. To some extent, a price rise may offset the financial loss for the grower who suffers the production shortfall, depending on the size of the farmer's harvest and the premium over the expected price. Crop revenue insurance is designed to meet any remaining shortfall in revenue from crop sales under such a scenario.

The extent to which this type of insurance product could apply to developing countries will depend primarily on the local crop futures markets. A necessary precondition for this product is the existence of commodities and derivative markets that enable insurers to protect themselves from price decreases and to pass all or part of the price risk to other risk takers.

Given the advantages to the grower and to the insurer, crop revenue insurance is likely to become increasingly important. However, for smaller crop areas, as with yield assurance, crop revenue insurance will always suffer from the problem of high administrative cost per unit of value.

The crop revenue approach follows from a new trend in agricultural insurance. This is to define the insurable interest as an income stream rather than as the expected value of the produce at risk. This automatically leads to considering the linkages between short-term farm loans and insurance. Farmers' capacity to service interest and principal payments on agricultural loans depends on the income stream such loans produce. Revenue insurance gives both the farmer and the financial institution certainty that income estimates on which loans are based will largely be realized.

Index insurance

With index insurance, the claim is calculated on the basis of the value of an external index, not on losses measured in the field. Indexes based on variables such as rainfall, temperature, and wind speed, which are naturally highly correlated with agricultural losses, and insurance products based on them, are designed to reflect as accurately as possible losses incurred by the farmer when a certain index value is recorded. For example, a wind index is based on wind speeds as measured at a named meteorological station. The index insurance starts to pay an indemnity when wind speed exceeds a specified level, termed the "threshold" or "strike" level. A meteorological trigger of this type cannot, however, be used for certain perils, such as hail, which normally impacts a very limited area of land. Rather, index insurance is suited to weather perils that have an impact over a wide area, such as drought and other single catastrophe perils.

Interest in insurance based on a weather index is currently high, because it offers an apparently practical solution to many of the barriers to classic crop insurance for small-scale, dispersed farmers in less developed areas of the world. In particular, it avoids the issues of moral hazard and adverse selection found in other types of insurance products. Moral hazard means that a farmer's behavior may change as a result of taking out insurance. Insured farmers may, for instance, undertake riskier production because they know that the insurance covers a possible loss. Alternatively, farmers may not do all that they can to reduce their vulnerability to adverse climatic conditions.

Adverse selection means that people who are more likely to suffer the insured event will be more willing to take out insurance. Index-based insurance gets around this, because an individual farmer is only one of a large number of producers whose output determines the index or the data used to construct the index. An index such as rainfall is also independent and observable and cannot be influenced by the insured. Because the payment of the indemnity is based on deviations from the index, no assessment of losses at the individual insured party level is needed. The indemnity process therefore becomes quick and inexpensive to administer, which has a positive impact on premium rates.

Despite these apparent advantages, the adoption of index products by both insurers and farmers is still low. From the farmer's perspective, as the insurance product is based on an index and the indemnity level is based on deviations from the index, individual producers face "basis risk," i.e., actual losses are not always fully correlated with the weather trigger. For example, a wind speed index insurance will normally not cover crop losses because of excess rain, flood, storm surge, or salinization of soils—events that are associated with tropical storms such as hurricanes and typhoons. Farmer acceptance of the product may therefore be lower than expected.

For the insurer, the task of assembling the data and constructing the appropriate indexes can be costly and time consuming. Although meteorological data are available in many countries, often for 50 years or more, the accuracy of the

data, the recording procedures, and the representativeness of weather stations in terms of numbers, locations, etc., may not be at the required level. Lack of efficient extension services and training programs also hampers the adoption of weather index insurance products. And in some countries, new legislation may be required to legitimize index products.

Good practices

Insurance administration

The management of insurance as a business has several stages. The overriding aim in the design of administrative structures and procedures is to lay a foundation for minimizing costs. Loss costs are particularly difficult to estimate, especially in the early years of an insurance product. Since the potential clientele comprises small-scale and often widely dispersed growers, administrative costs can easily escalate to the point of the business not being viable. Product administration and management require good knowledge of insurance, which in turn normally means that a licensed insurance provider has to be involved.

Market identification

Buying insurance means increasing the up-front costs for a farmer. The advantages of buying cover must therefore be clear, with careful positioning of any proposed insurance product. Careful attention must be paid to cost–benefit considerations for both the insured and the insurer. In general, the more commercial the operation, the more likely it is that insurance can be designed to address specific risks involved.

Product development

Once the administrative business structure has been identified, i.e., prime insurer, reinsurer, handling agents, etc., attention must be given to developing a product or line of products that meet an already identified demand. At the product development stage, it is necessary to identify the point at which insurance could most economically impact and contribute to farmers' risk management strategies.

Product development is a highly skilled task that requires detailed knowledge of farming, coupled with a sound appreciation of the principles and operational imperatives of insurance. One of the many challenges to the insurance industry is maintaining the skills and expertise at the level of the underwriter, loss adjuster, and reinsurer, not only to provide adequate levels of insurance but also to assist the agricultural industry to improve its risk management practices to enhance production.

Marketing

Implicit in any attempt to start crop insurance is the assumption that there is real demand for the product. Whereas automatic insurance has many advantages, it is

not always possible to design this type of policy. Working closely with representatives of the farming sectors will help ensure that the service and products are in real demand. Similar linkages should be established with banks, farm product buyers, and others with business connections with farmers.

Setting indemnity and premium levels: Deductibles

It is vital that a balance be struck between premium and indemnity levels, and that this balance be continually checked to ensure the financial sustainability of the program and its ability to meet commitments to the insured farmers. As most insurance policies do not offer full coverage against losses, the level of deductible, also known as an "excess," that applies becomes a key issue. The deductible is an element of risk sharing and is expressed as the percentage of the loss that is borne by the insured. A deductible means that minor losses will not prompt a claim and therefore no loss assessment will take place.

Insurance products in agriculture are seldom launched on the basis of all the data an insurer would wish to have to set premiums at the level required to meet expected indemnity liabilities. Experience must be gained during the early years of a program. During this period, adjustments can be made to the indemnity and premium levels and to the percentage of deductible applied.

Collecting premiums

The main objective is to keep costs as low as possible, so there is a strong incentive to build linkages with existing providers of services to farmers. Perhaps the most obvious linkage is between the insurer and banks serving the same clientele, with the loan included as a component of the seasonal cropping expenses. Since the premiums in such cases are paid in bulk by the banks to the insurer, costs are minimized. Small-scale farmers, however, are likely to be excluded, because their access to financial institutions in general is very limited.

Handling claims

Again, cost containment is very much an objective in designing procedures for notifying claims, for assessing losses, and for paying indemnities. Clearly, the big divide is between the older, traditional type of policy, in which losses need to be assessed on each farm, and the newer types of policies, such as index-based insurance, in which a more wholesale approach is possible.

Reinsurance

When the total exposure of a risk or group of risks presents a hazard beyond the limit that is prudent for an insurance company to carry, the insurance company may purchase reinsurance (i.e., insurance of the insurance) from international reinsurers.

It is important to establish strong linkages with international reinsurers early in the process of developing crop insurance. Such reinsurers can assist with technical

advice and can be instrumental in ensuring the correct application of procedures for setting premiums and settling claims. Although the opportunity for profit may be some years away, such companies are often prepared to be involved in a new geographical field of business. They operate with long-term time horizons, which can work very much to the benefit of a nascent crop insurer.

Action areas

Roles for government

Although insurance belongs in a business setting, the very nature of crop insurance means that a strong governmental involvement is highly likely. Most governments are very interested in risk management in agriculture, both for productivity and because of concern for the well-being of rural populations. This often means in practice that governments are active in an overall policy sense and are closely involved with interventions ranging from the initial investigation of the feasibility of introducing crop insurance products to their eventual promotion, and even to financial participation. A government presence in the market fills a void left by the private sector, which is sometimes reluctant to enter this market segment because of high start-up, distribution, and administrative costs. The private sector also often offers insurance products with premiums that are beyond the financial capacity of small-scale farmers.

According to a recent World Bank survey on public interventions in agricultural insurance (Iturrioz 2009), the most common mechanisms for public sector involvement in such markets are premium subsidies, investment in product research and development, training, information gathering, development of specific agricultural insurance legislation, public sector reinsurance, and administration cost subsidies.

Although government support is required, the strong reasons for the business operations in insurance to be handled by a commercial concern are efficiency and convenience in terms of insurance operations complementing other commercially run services to farming.

This dual parentage of crop insurance can lead to tensions. The most crucial areas of concern are premium setting and claims handling, in which undue and inappropriate political influence on an insurer can be very damaging.

The way forward

The question arises as to why crop insurance for small-scale farmers in particular is not more developed, despite recent product innovations and the establishment of many index-based pilot insurance programs. Apparently, many of the conditions for the risk to be considered insurable and for a self-sustaining market to appear are simply not met. High administrative costs are among the most important impediments to the generation of a sustainable market. Another issue is the clear mismatch between farmers' preferences and willingness to pay. Farmers seem to

prefer insurance that protects a sizeable proportion of income from multiple threats rather than covering income loss from one specific threat.

Another impediment is distorted government incentives. When governments intervene and make unconditional emergency relief payments, forgive loan contracts, and/or offer subsidized emergency loans, the incentives for farmers to purchase insurance and for insurance companies to offer suitable products are removed.

Agricultural and crop insurance for small-scale farmers will most likely continue to be high on the agenda of governments and aid agencies alike. Continued research will hopefully help overcome some of the current problems. One question that might be addressed by research is: could collective insurance, as opposed to individual insurance for smallholders, be a way forward? More work may also be needed on farmers' perceptions of risk and their present risk management strategies. Whatever new developments occur, we still have to recognize that insurance, even when commercially sustained, can play only a limited role in managing the risks related to farming.

Fiscally stressed, low-income countries would be better advised to concentrate on developing an integrated and layered risk management system, rather than viewing crop insurance as a panacea. An integrated and layered system would include on-farm, individual risk-reducing and coping activities and strategies; informal group-based or mutual insurance schemes (managed by competent farmer cooperatives/associations and when legislation so allows); formal private market insurance programs; and government-sponsored and -financed disaster relief programs.

In the case of individual small-scale crop and livestock farmers, the recent debate points to the need to shift the focus from insurance to improving on-farm risk management measures and tools, on the grounds that there is more efficiency to be obtained from reducing small-scale farmers' exposure to risk than from coping with the effects of risk. As far as risk-coping mechanisms (the category to which insurance belongs) are concerned, building up assets, especially savings and deposits, appears to be a better alternative than insurance.

In practice, agricultural insurance is almost invariably an adjunct to a whole set of risk management measures, of which adequate farm management practices constitute the most important ones. Insurance by itself is no substitute for good production practices. The acid test of developing and operating an insurance program to complement other risk management measures is ultimately the cost of the program and the expected benefit, both for the farmer and for the potential insurance provider.

References

Food and Agriculture Organization (FAO). 2007. Crop insurance. Agrifood Systems Brief No.1. Rome.

Iturrioz, R. 2009. Agricultural insurance. *The World Bank Primer Series Insurance*, Issue 12 (November). Washington, DC.

Roberts, R. A. J. 2005. Insurance of crops in developing countries. *FAO/AGS Bulletin No. 159*. Rome.

_____. 2007. Livestock and aquaculture insurance in developing countries. *FAO/AGS Bulletin No. 164*. Rome.

Roberts, R. A. J., and W. J. A. Dick. 1991. Strategies for crop insurance planning. *FAO/AGS Bulletin No. 86*. Rome.

Picking the "low-hanging fruit" first

Adapting to climate change

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Climate change compounds the burden of Asia's farmers—the good news is many are weathering the storm by using agricultural practices already readily available and locally appropriate.

Despite rapid social and economic development in the past decades, the Asia and Pacific region has both the greatest concentration of food-insecure households and the highest incidence of poverty globally. About 63% of the world's undernourished people are located in the region as well as two-thirds of the world's poor. Faced with increased competition for natural resource use and accelerated degradation of the environment and ecosystems—in a context where the population in the region is expected to grow by another 1.5 billion people by 2050—food security and sustainable development are and will continue to be major concerns. Climate change has compounded these challenges.

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), released in April 2007 (Solomon et al. 2007), concluded that most of the increases in global average temperatures observed since the mid-20th century are very likely a result of the increase observed in anthropogenic greenhouse gas (GHG) concentrations, mainly in the forms of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

The impacts of climate change in this region have been observed in the last decades and projected under different scenarios, including increase of temperature and rainfall variability across the region, retreat of glaciers and permafrost in snow-capped mountains, decrease of freshwater availability in most of the region, increase of extreme weather events in many countries, and sea water intrusion and flood risks in small island countries and coastal areas. Although some specific areas may benefit, most of the region will be negatively impacted, especially the small Pacific island countries.

The agriculture subsectors, including crop and livestock production, forestry, and fisheries, are vulnerable to climate change. Climate change affects the basic

elements of food production—soil, water, and biodiversity—and as such impacts all dimensions of food security. The IPCC's A2 scenario projects that an additional 49 million people in Asia will be at risk of hunger by 2020.[1] The A2 Asian hunger-risk projection for 2050 is 132 million and for 2080 it is 266 million (Solomon et al. 2007). The region's agriculture sector will have to respond effectively to the impact of climate change to ensure regional food security. Action is needed now. Inaction will significantly increase future costs.

Issues and challenges

Various initiatives in climate change adaptation in the agriculture subsectors have been taken by the international community, government departments, academic institutions, nongovernment organizations (NGOs), rural communities, and farmers in this region. The lessons learned and experiences generated so far suggest that a number of issues need to be specifically addressed.

Complexity of the regional context and climate change impacts

The region presents a diversified agroecosystem and socioeconomic context. The impact of climate change will vary across geographic areas as follows:

- The Himalayas will suffer from increased freshwater variations and flash floods because of glacier melting.
- Low-lying coastal areas and deltas will have more frequent and intense floods, lose land, and experience saline water intrusion because of extreme weather events and sea level rise.
- Arid zones will be highly exposed to intensified droughts and water scarcity because of reduced rainfall and increased evapotranspiration.
- Small islands will face sea level rises and storm surges.

A recent Asian Development Bank assessment indicates that, in the Asian subregion, Afghanistan, Bangladesh, Cambodia, India, the Lao People's Democratic Republic, Myanmar, and Nepal are the countries most vulnerable to climate change. Bhutan, the People's Republic of China (PRC), Pakistan, Thailand, Timor-Leste, Uzbekistan, and Viet Nam are significantly vulnerable. Smallholder farmers, forest dwellers, herders, and fishers who live in fragile areas with limited access to natural resources and adaptation capacity will be the most affected (ADB 2009). There is

[1] The IPCC developed "A set of scenarios … to represent the range of driving forces and emissions in the scenario literature so as to reflect current understanding and knowledge about underlying uncertainties."

"The A2 storyline and scenario family describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented than in other storylines" (IPCC 2000).—Ed.

no "one size fits all" solution. Tailor-made options are needed for different areas based on local contexts.

Multiple requirements of agriculture subsectors

The agriculture sector contributes to GHG emissions yet also offers high potential to mitigate them. Agriculture contributes 13.5% of current global GHG emissions; land-use change and forestry contribute another 17.4%. About three-fourths of these emissions originate in developing countries. The agriculture sector's mitigation potential arises from the possibility to reduce GHG emissions and the ability to provide carbon sinks. It is estimated that the "technical mitigation potential" of forests will be equivalent to about 64% of the forestry sector's emissions by 2050. The technical mitigation potential of agriculture is estimated at 83%–91% of the agriculture sector's emissions by 2030. Without a significant contribution from agriculture, the target of cutting global GHG emissions by 50% from 1990s levels is not likely to be met.

Asia accounts for 37% of global GHG emissions from agricultural production. South Asia and East Asia contribute 43% of global N_2O emissions from soils and 47% of global CH_4 emissions from enteric fermentation. The PRC and Southeast Asia contribute more than 90% of CH_4 emissions that come from the world's rice production. Considering other challenges related to land and water scarcity, environment degradation, and demographic change, the agriculture sector needs to meet the multiple requirements of climate change adaptation, mitigation, food security, and sustainable development.

Data and information generation

Countries need a sound understanding of climate change impacts and their implications for their food systems, ecosystems, societies, and national economies. They need this to be in a position to take proactive and anticipatory adaptation actions to address short-term climate variations and to prepare for the long-term impacts resulting from changes in mean temperatures, rainfall, salinity, and sea levels. However, because of the uncertainties of CO_2 fertilization effects, socioeconomic pathways, and countries' adaptive capacities, reliable impact scenarios are often not available at the national and subnational levels.

It is crucial to develop climate change scenarios and models further in order to make them more area specific. At the same time, developing countries will need to conduct comprehensive climate-change monitoring and forecasting and develop stronger capacity in climate change analysis and research to enable scientific planning and informed decision making for climate change adaptation and mitigation.

Science and technology development

Local knowledge and practices exist in many areas for coping with seasonal and annual climate variability. Today, the need to increase production, coupled with

the speed and magnitude of the expected changes in climate, mean new challenges for farmers. Traditional coping mechanisms often will not be sufficient for dealing with the expected medium- to long-term impacts of climate change. To adapt agriculture subsectors to the expected impacts of climate change, further science and technology development is needed to

- breed new crop and animal varieties,
- improve the adaptive capacity of production and management systems,
- promote efficient use of agricultural inputs and wastes, and
- integrate these features in the context of typical farming systems and agroecological zones.

To realize the mitigation potential of the agriculture sector, further research on mitigation technologies relevant to Asian and Pacific farming systems is needed. Suitable monitoring, reporting, and verification systems for both national and smallholder implementation need to be developed for monitoring commitments and developing carbon financing mechanisms.

National and local capacity development

In view of the limited national and local capacity in developing countries, continuous capacity development is needed at different levels to

- upscale indigenous climate-proofing practices;
- disseminate updated information and technologies; and
- strengthen local capacity for climate change monitoring and analysis; vulnerability assessment; strategy and policy formulation; institutional innovation; integrated planning; proper mainstreaming and implementation; and monitoring, reporting, and verification of mitigation activities.

Innovations and good practices

Picking the "low-hanging fruits"

A wide range of adaptation options is available in the agriculture sector. Integrated planning embodying all concerned sectors, combining all suitable and necessary options, and following an agroecosystem approach will enable effective responses to specific local needs in different areas. Many successful practices derived from sustainable agriculture, forestry, fishery, natural resource management, and rural development are readily available, locally appropriate, and cost effective. These "low-hanging fruits" can be picked first. Good examples include changing crop and livestock varieties, changing cropping patterns, changing agricultural land and inputs use, improving agricultural water management, and diversifying agricultural activities among crops within agriculture subsectors and beyond.

Change of crop varieties. As drought conditions emerged in traditional ricefields in some parts of Bangladesh, rice varieties with shorter growing seasons and fruit and vegetable crops with relatively low water requirements were introduced. As a result, farmers harvested high-value cash crops to sell at the market. To avoid

the impact of floods, farmers in some other areas of Bangladesh plant early or late varieties of transplanted aman (wet season) rice. The early production of rice encourages the growing of additional crops, which increases farmers' incomes.

Change of livestock variety. In the Tibetan Plateau, extreme cold weather conditions affect the productivity and even survival of livestock. In the PRC's Western Sichuan Province, livestock breeders select breeding yak (jiulong or valley-type, and maiwa or plateau-type) that are tolerant to extreme cold weather. This increases the animals' resilience to cold weather conditions and stabilizes the people's food supply and income generation.

Organic farming. In Yasothorn Province of Thailand, prolonged drought and unpredictable flooding were destroying rice crops. Local farmers adopted organic jasmine rice farming through assistance from an NGO. The practice has been successful. Soil fertility has been increased, and families report higher rice yields and much higher profits, as they do not use chemicals. Furthermore, organic rice proves to be much more resistant to drought and water scarcity than chemically grown rice.

Agricultural diversification. To cope with consecutive droughts, farmers in the semiarid Jhalawar District in Rajasthan, India have shifted from traditional crops (such as sorghum and pearl millet) to soybean, which fetches higher market prices and yields fast returns because of its shorter life cycle. To respond to the impacts of sea level rise and sea water intrusion, rice–shrimp farms have been developed in Viet Nam in the Mekong Delta. These farms are facilitated by flexible water control structures allowing for both freshwater and brackishwater control.

Capturing the synergies

Many good practices in agriculture can also help mitigate climate change by enhancing or preserving carbon sinks or reducing GHG emissions. These include improving rice cultivation, improving pastures and grazing land management, improving agricultural water management, and practicing no-tillage agriculture and agroforestry. These practices offer good chances for capturing synergies among adaptation, mitigation, food security, and sustainable development in the agriculture sector. They are normally cost effective and suitable for smallholder farming in developing countries. In view of limited financial resources, the lack of climate change information, and the uncertainty of climate change impacts, these practices must be given high priority for scaling up.

Improved rice cultivation. Rice is a significant contributor to CH_4 emissions. Research shows that combining high-yielding varieties, improved fertilizer use, shifts to rice–wheat production systems, alternating dry–wet irrigation, and utilizing crop residues for renewable energy can reduce GHG emissions. At the same time, combining such options builds resilience by conserving water, reducing land requirements, and reducing fossil fuel use. The PRC and India could each reduce their CH_4 emissions from ricefields by 26% at low cost (less than $15 per ton of CO_2 equivalent) by 2020.

Grazing land management. Degraded or overgrazed land can be restored to produce more biomass by selectively planting grasses, adding phosphatic fertilizers, and alternating grazing with rest periods for the land. Increased biomass productivity enhances soil cover, increases moisture availability, and increases the overall amounts of stable organic matter in the soil. These will benefit livestock production and herders' livelihoods while decelerating grazing land desertification. In Asia, large technical potential exists, especially in India, which has one of the world's largest grazing land areas.

Agricultural water management. Water is the primary medium through which climate change influences the earth's ecosystems and, therefore, people's livelihoods and well-being. Adaptation to climate change is mainly about better water management. Asia and the Pacific is currently the region most heavily hit by water disasters. Climate change will worsen the situation. A wide range of good agricultural water management practices is readily available for replication, including modernization of irrigation schemes, water saving irrigation, community-level water control, water harvesting, and on-farm water management. The main constraint now is lack of investment.

Nontillage agriculture. Reducing tillage is an effective mitigation and adaptation strategy, especially in South Asia. In the last decade, farmers in the rice–wheat farming system in the Indo-Gangetic plain of Bangladesh, India, and Pakistan have adopted minimum-tillage practices widely, which conserves resources under climate change. Since being introduced in the late 1990s, zero tillage for wheat has been adopted rapidly by more than 1 million farmers . Farmers' wheat yields have reportedly improved, and production costs have decreased by an average of $65 per hectare, with additional benefits being water conservation and reduced use of herbicides.

Agroforestry. While increasing farmers' resilience to climate change and improving food security and rural livelihoods, agroforestry systems increase carbon storage and may also reduce soil carbon losses stemming from erosion. Options include combining crops with trees for timber, firewood, fodder, and other products, and establishing shelter belts, riparian zones, and buffer strips with woody species.

Biogas. Anaerobic digestion of animal dung produces biogas. Biogas projects have been implemented at the household and village scale for producing cooking fuel and electricity. Such projects originated in the PRC, where 15 million households had access to biogas and plans were to expand the access to 27 million households, or 10% of rural households, by 2010. Similar programs have had success in India, Nepal, and Viet Nam. In India, more than 12 million biogas plants have been installed, with a high rate of continued functioning. Since 1992, more than 140,000 biogas plants have been installed in Nepal. Biogas production improves indoor air quality and livelihoods, decreases the strain on scarce resources, saves women's labor time, and provides organic fertilizer.

Managing the risks in an integrated approach

Climate change is creating increased uncertainty about future agricultural production elements, and increases the risks attendant to investments in agriculture and other weather-dependent livelihoods. Integrated disaster risk management could be a good approach to adopt. This requires (1) improved infrastructure systems to protect against asset losses; (2) proper weather and climate monitoring systems and models to provide quality information and advisory services for agricultural communities; (3) reliable and timely early warning systems; (4) rapid emergency response capacity; and (5) effective social safety networks, including innovative risk financing instruments and insurance schemes to spread residual risks.

The Food and Agriculture Organization (FAO), in cooperation with the PRC government, implemented the project, Strengthening Disaster Preparedness of the Agricultural Sector in China during 2007–2009. The project integrated a disaster risk-management approach in Juye County, an area in Shandong Province that is highly vulnerable to flood and drought disasters. The project has proved to be successful by

- improving water control infrastructure;
- strengthening an early warning system for water disasters, agricultural production, and marketing from the provincial to the village levels;
- enhancing integrated disaster risk management plans for the county level; and
- establishing and empowering farmers' organizations for participatory disaster risk management at the community level.

Mainstreaming adaptation into development plans

Participatory planning under the framework of a national adaptation program of action (NAPA) can be a good approach to develop strategies and frameworks for climate change adaptation in the agriculture sector. NAPAs can also be employed to outline the objectives and actions for technology development and transfer, capacity development, and financing. Based on the local context, NAPAs can be used to maximize the synergies and minimize the trade-offs among climate change adaptation, mitigation, food security, and sustainable development. NAPAs need to be mainstreamed into national and local agriculture and socioeconomic development plans with the strong engagement of all stakeholders and special attention to gender issues.

Participatory planning in Viet Nam. As a response to recurrent climatic catastrophes, a community-based adaptation project was implemented in eight villages of Thua Thien Hue Province in Viet Nam in 2002. Involved communities worked together with the government in scenario building, adaptation planning, and implementation. Through consultations with local social groups and organizations, including those for farmers, fishers, women, and youths, "safer village plans" were developed and implemented. These include livelihood improvements in agriculture and aquaculture, disaster management protocols, and other strategies.

FAO's vehicles for mainstreaming. FAO has been assisting subregional bodies and member countries in the Asia and Pacific region to mainstream their climate change planning and considerations into national agriculture, food security, and development strategies and plans, mainly by formulating national programs for food security and government–FAO national medium-term priority frameworks.

Tailor-made capacity development

Capacity development needs to be tailored to different levels in different countries. Although training for rural communities and farmers may focus on practical knowledge and tools, capacity development for national institutes and government departments must be more holistic, covering all policy, institutional, and technical aspects based on their needs. Relevant training modules and extension materials need to be carefully prepared, and a participatory approach should be incorporated into all training and capacity development activities.

Farmer field school. As a training methodology, the farmer field school (FFS) is widely applied all over the world in various FAO field programs and projects for agricultural development, natural resource management, and food security. The FFS was developed for training and capacity development at the rural community and farmer levels. The FFS fully involves all the trainees in a step-wise on-the-job training process, from needs assessment to training planning, implementation, and evaluation, and has been proven effective. Recently, the FFS has been used as a means to transfer knowledge about adaptation in agriculture to farmers.

UN–REDD. The United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN–REDD) is a collaborative initiative of FAO, the United Nations Development Programme, and the United Nations Environment Programme. UN–REDD was launched in September 2008. It is a sector capacity development program with two overriding objectives: (1) assisting developing countries to prepare for participation in a future REDD mechanism, and (2) supporting the development of guidance and standardized approaches based on sound science. UN–REDD mainly addresses issues on monitoring, reporting, and verification; stakeholder engagement; multiple benefits; and a strong institutional framework, including payment structures.

Action areas

For better replication and upscaling of these innovative ways and good practices, some further actions are needed.

Technical preparation

This can serve as the first step for replication and upscaling of climate-proofing practices, including

- identification and summarization of good agricultural practices following typological classification of agroecosystems in the Asia and Pacific region;
- development and dissemination of relevant training modules and extension materials;
- technical and institutional capacity development at the regional, national, and local levels; and
- research into and development of relevant agricultural science and technologies.

Country programming

Under the framework of a NAPA, national appropriate mitigation actions, and national programs for food security, a specific action plan and investment framework on climate change adaptation and mitigation in the agriculture sector need to be formulated. The action plan must then be phased in, based on country-specific capacities, circumstances, and sustainable development processes, starting from a suite of country-led pilot projects to develop readiness, confidence, and capacity for further replication.

Innovative financing

Although the average adaptation cost in the Asia and Pacific region is higher than in other regions, many low- or no-cost "win–win" options are available in Asia and the Pacific, such as low- or no-tillage farming and reduction of CH_4 emissions from ricefields. Agriculture has been largely excluded from the main climate change financing mechanisms. The limited financing windows that are available are mainly for mitigation. An innovative financing mechanism is needed that includes agriculture, rewards synergistic actions, and addresses the specific needs of smallholder farmers.

Better governance

Relevant policy and legislative frameworks need to be established to assign responsibilities within the governance structures. Land tenure and water rights issues need to be better addressed to allow farmers to make necessary changes in land management and farming practices. To ensure the effectiveness of mitigation activities, a comprehensive land-use management approach needs to be adopted to minimize leakage, i.e., displacement of emissions between sectors and areas. A proper planning approach and mainstreaming procedure must be adopted to incorporate agricultural adaptation and mitigation into NAPAs and national appropriate mitigation actions, and to mainstream them into agriculture and development plans.

Regional cooperation

It is necessary to strengthen regional cooperation further on several issues, including

- climate change modeling and projection;
- transboundary water, forestry, and marine resources management;
- transboundary crop, plant, and animal disease control;
- large-scale disaster and emergency control; and
- biodiversity conservation.

The formulation of a regional strategy and establishment of a regional cooperation network on climate change adaptation and mitigation in the agriculture sector may better facilitate coordinated action, information sharing, policy dialogue, technical cooperation, and capacity development within the region.

References

Asian Development Bank (ADB). 2009. *Building climate resilience in the agriculture sector of Asia and the Pacific*. Manila.

Food and Agriculture Organization (FAO). 2008. *Climate change and food security in Pacific island countries*. Bangkok.

_____. 2009a. *FAO profile for climate change, 2009*. Rome.

_____. 2009b. *Feeding the world in 2050*. Rome.

_____. 2009c. *The state of food insecurity in the world*. Rome.

_____. 2010. *Food security and agricultural mitigation in developing countries: Options for capturing synergies*. Rome.

Intergovernmental Panel on Climate Change (IPCC). 2000. IPPC Special report: Emissions scenarios; Summary for policymakers. http://www.ipcc.ch/pdf/special-reports/spm/sres-en.pdf.

Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller, eds. 2007. *Climate change 2007: The physical science basis; Contribution of working group I to the fourth assessment report of the Intergovernmental Panel on Climate Change*. IPCC. Cambridge, UK and New York, US: Cambridge University Press.

Taking a holistic approach

Transboundary animal disease control

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Regional and global networks and multisector collaboration, rather than a country approach, show the way to control the spread of animal diseases such as avian and swine flu.

All animal diseases have the potential to affect human populations adversely by reducing the quantity and quality of food, other livestock products (hides, skins, and fibers), and animal power (traction and transport) that can be obtained from a given quantity of resources and by reducing people's assets. Of these, transboundary animal diseases (TADs) tend to have the most serious consequences.[2] TADs may be defined as epidemic diseases that are highly contagious or transmissible and have the potential for very rapid spread irrespective of national borders, causing serious socioeconomic and possibly public health consequences.

TADs, which cause high rates of morbidity and mortality in susceptible animal populations, constitute a constant threat to the livelihood of livestock farmers. Furthermore, their potential consequences are of such a magnitude that their occurrence may also have a significant detrimental effect on national economies.

TADs have the potential to

- threaten food security through a serious loss of animal protein and/or a loss of draught animal power for cropping;
- increase poverty levels, particularly in poor communities that are highly dependent on livestock farming for sustenance;
- cause major production losses of livestock products such as meat, milk and other dairy products, wool and other fibers, and skins and hides, thereby reducing farm incomes;
- restrict opportunities for upgrading the production potential of local livestock industries by making it difficult to utilize exotic high-producing

[2] FAO EMPRESTADs web page. http://www.fao.org/ag/againfo/programmes/en/empres/diseases.asp

breeds, which tend to be very susceptible to TADs;
- add significantly to the cost of livestock production because of the need for costly disease control measures;
- seriously disrupt or inhibit trade in livestock and livestock products, within a country or internationally, possibly resulting in major losses in national export income in countries that produce a significant amount of livestock;
- have public health consequences, in the case of TADs that can be transmitted to humans (i.e., zoonoses);
- have environmental consequences through die-offs in some wildlife populations; and
- cause pain and suffering among affected animals.

Issues and challenges

Growth of trade interdependence

As globalization and trade interdependence have grown, so too have the threats associated with smuggling and other actions that circumvent orderly trade. Informal movements of domestic animals across national borders have their roots in economics, cultural linkages across porous borders, and the growing interdependence between industries and producers of raw materials. Although the movements are complex and profitable for market participants and for economies as a whole, the movements clearly can result in the introduction of animal diseases or human pathogens.

The risks and potential costs of animal disease transmission through infected products are escalating as industries become more concentrated. Differential demand growth in adjoining countries translates into more animal or commodity movements across borders, potentially shifting the burden and costs of disease outbreaks into neighboring countries. As a result, the impacts of localized animal disease outbreaks can quickly become regional and global problems, and can lead to diverging trading relationships; changing consumption patterns, including shifts between meat types and sources; as well as price shocks.

Livestock's role in rural economies

It is important to consider the role played by livestock in poverty reduction and food security in rural economies. Livestock are a strategic part of the small farm economy in the region. The demand for livestock products in the region is projected to grow by 3.5%–4% annually to the year 2020 (Delgado et al. 1999). This increase will present clear opportunities for reducing poverty among poor smallholders and allow for affordable access to food. Poverty reduction will be achieved by improving the incomes of poor smallholders through commercialization of their livestock production. However, to fully participate in these market opportunities, poor smallholders will have to produce healthy and productive animals. But morbidity and mortality rates of livestock because of disease are often as high as 50%–70%.

A study in Viet Nam shows that the average economic loss in a commune because of a disease such as foot-and-mouth disease (FMD) amounts to $4,463 (Tung and Thuy 2007). In total economic terms, during 1997–2001, losses in Viet Nam resulting from FMD amounted to $10 billion.

In a household, men usually manage the raising of cattle and buffalo, whereas the women manage the family house and tend to small ruminants, pigs, and poultry, which they often tap as sources of readily available protein for the family's diet. Women also sell these animals, providing the family with ready access to cash. The role of livestock among women livestock raisers has often been underestimated and undervalued. Because of their varying roles in the household, women have detailed knowledge of the dynamics of their ecosystem and the influence of livestock on it. They can monitor the condition of ranges through milk production, an animal's appearance, wool production, manure production, etc. Women frequently have detailed knowledge of water resources, including their quality and quantity. They understand certain animal diseases, symptoms, pharmacology and cures, and herding practices designed to reduce disease incidence. Training opportunities on properly raising livestock must therefore be provided to the rural poor, especially the women.

At the same time, the rural poor, men and women alike, are especially exposed to zoonotic pathogens because of the proximity of their living spaces to farm animals and because they may not be adhering to good animal production practices. Consequently, the strategic challenge for disease control in Asia and the Pacific is to balance development and disease control interventions in an innovative way.

Availability, type, and quality of policy interventions

Policy interventions for animal disease control need to recognize the different impacts that selected animal disease controls will have on different stakeholders as well as the regional risks and impacts of disease outbreaks. Serious development gaps among countries lead to varying levels of legislation, border controls, quality of public services, and industrial structures. Uneven development across the region is reflected by different policy, institutional, technical, and field-level support, ultimately often leading to unsustainable solutions for disease control. Therefore, strong regional coordination is needed to harmonize policies, strengthen public and private veterinary services, and develop regional plans to prepare for disease outbreaks.

Public health issues

There is increased recognition that the major cause of many new and emerging human diseases and public health emergencies is pathogens originating from animals and animal products. The Asia and Pacific region has increasingly been at the forefront of many regionally coordinated and national emergency actions related to animal disease outbreaks during the last 10 years.

Regional production systems combining high population densities and the raising of animals on mixed rainfed and irrigated farms, which represent 70%–80% of all agricultural land, have increasingly raised concerns about animal–human interactions and the risks posed to both animals and people. Many of the risks of zoonoses are linked to the structure of farming systems, the human–animal interface, and the role of market linkages.

Innovations and good practices

In view of the longstanding threats caused by TADs, the continued risks posed by the highly pathogenic avian influenza (HPAI), and the increased prevalence of emerging infectious diseases, the Food and Agriculture Organization (FAO) remains dedicated to supporting member countries in their fight to prevent and control animal diseases at their source. Five years of efforts to combat HPAI have taught many lessons. To be efficient, prevention and control programs must rely on veterinary services provided with the appropriate resources and supported by strong policy.

Control strategies must apply the FAO and World Organization on Animal Health (OIE) standards through recommended best practices among animal health and disease control systems. These include strong multisector collaboration, coordination, and partnerships among national and international organizations as well as between public and private sector producers and traders operating throughout the marketing chain. Best practices to ensure adequate biosecurity measures in livestock farms and markets must be implemented. Drivers for animal production and trading must be understood from the socioeconomic point of view, and appropriate and timely communications must be in place. Some of the best practices and innovative approaches for which FAO took the lead are described in the following section.

Multisectoral collaboration, coordination, and partnerships

International coordination. At the international level, through the Emergency Centre for Transboundary Animal Diseases (ECTAD) and the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases, FAO is working within international frameworks such as the Global Framework for the Progressive Control of Transboundary Animal Diseases and the newly established One Health Initiative to promote a collaborative approach to investigation at the animal–human–ecosystem interface and a coordinated effort for rapid response to emerging infectious diseases.

In 2006, FAO and OIE reinforced their collaboration with the establishment of the Global Early Warning System and a joint OIE–FAO network of reference laboratories, epidemiology centers, and groups of experts on animal influenza to ensure disease tracking and intelligence, and exchange and tracing of virus strains.

FAO, together with OIE, also launched the Crisis Management Centre–Animal Health in October 2006. This center forms part of ECTAD and is charged with implementing emergency response procedures and protocols based on the Incident Command System for a functionally based emergency response. The center mobilizes technical and operational resources to respond to outbreaks in newly infected countries. Since the center became operational, FAO has implemented its rapid assessment and response capacity through missions deployed on official government request. Recently, FAO has assisted countries that encountered disease emergencies such as the Porcine Reproductive and Respiratory Syndrome in Viet Nam; FMD outbreaks in Bangladesh and the Democratic People's Republic of Korea; rabies outbreaks in Bali, Indonesia; the Ebola Reston infection in swine in the Philippines; and brucellosis outbreaks in Fiji.

Public–private partnerships. Partnerships with the private sector, particularly with producers and traders as well as other private enterprises (e.g., pharmaceutical companies and feed producers), are important in the field of surveillance, husbandry practices, and communication. Partnerships with nongovernment groups, research institutes, and reference centers are also important. Close coordination with the private sector was forged in Bangladesh to develop biosecurity guidelines for poultry farms. The same dialogue was conducted in Indonesia to assist the country in controlling HPAI.

Regional laboratory and epidemiology network. Specific to HPAI, the Collaborative Framework for Regional Laboratory Networks in Southeast Asia has been developed among FAO; OIE; the Australian Animal Health Laboratory; and leading laboratories for HPAI in Southeast Asia, including the Malaysian Veterinary Research Institute and the Thai National Institute of Animal Health; and with other key international partners in the region. Under the framework, common regional meeting and training plans as well as country visits by regional laboratory experts will be organized on a cost-sharing basis among the partners. Through this regional laboratory network, laboratory testing procedures and their quality control can be harmonized, thus allowing the interpretation of laboratory results in the regional context.

Similarly, an epidemiology consortium for HPAI, TADs, and other emerging infectious diseases has been formed, and its members have agreed to collaborate on epidemiology-related activities, including capacity development, information sharing, and knowledge generation and utilization, under the Collaborative Framework for Regional Epidemiology Networks. Harmonization of field surveillance methodology will also allow the interpretation of surveillance results from different countries in the regional context.

Arrangements for collaboration among members of consortia and networks would allow all partners to effectively share information and to maximize their resources and minimize the duplications that may result from overlapping support provided by different international organizations.

Building human capabilities from grassroots to regional levels

Participatory disease surveillance and response. FAO has provided technical input to the Indonesian Ministry of Agriculture, with financial contribution from the United States Agency for International Development (USAID), to build capacity and implement active animal surveillance and response through the Participatory Disease Surveillance and Response Program. Animal health teams have been provided with a cascade training program focusing on surveillance, containment, and prevention skills and with the means to conduct field activities and report findings into the national and local systems. With USAID support, 2,151 officers are active in 324 districts.

As of November 2009, 324 high-risk districts covering all districts of Bali, Java, Sumatra, and all provinces of Sulawesi and Kalimantan, had active participatory disease surveillance and response teams providing systematic surveillance, control, and reporting of avian influenza outbreaks among small-scale and backyard poultry farmers as well as intelligence about the transmission and risk factors of avian influenza.

From January 2006 to November 2009, participatory disease surveillance and response teams conducted more than 206,000 surveillance visits and reported more than 6,700 outbreaks of avian influenza in participating districts, meeting with more than 2 million poultry farmers and community members in their efforts to prevent and control the disease.

Community animal health workers. Trained community members—referred to as village animal health workers, village veterinary workers, village livestock workers, paraveterinarians, or community animal health workers (CAHWs)—provide basic animal health services at the village level in most countries throughout the region. Following basic training in disease recognition and simple treatment, they operate privately, earning at least part of their income from village animal care.

Since the first outbreaks of HPAI, CAHWs have actively participated in HPAI control in many countries: Grassroots-level field surveillance and early warning networks have been established, using the CAHW networks as existing village social structures to create culturally compatible information-gathering systems. In countries with limited veterinary services, an operative and sustainable CAHW system may contribute significantly to the livelihoods of resource-poor rural communities by providing basic veterinary services and through early detection of disease and facilitation of rapid control measures.

There have been continuing formal discussions about how to understand better the strengths and weaknesses of different CAHW systems in the region, develop strategies for sustainable CAHW systems, and identify feasible options for a sustainable disease control and surveillance system based on community-based animal health services.

FAO, jointly with OIE, organized several training courses specifically on outbreak investigation for CAHWs and veterinarians at various levels in Cambodia,

the Lao People's Democratic Republic (Lao PDR), and Viet Nam using harmonized training material. FAO and OIE continue to work with the governments of these countries to harmonize the outbreak investigation methodology at the country level using common standard operating procedures (SOPs).

Regional field epidemiology training program for veterinarians (FETPV). This training program for veterinarians in the Asia and Pacific region has been developed by FAO in consultation with the Department of Livestock Development, Ministry of Agriculture and Cooperatives, Thailand in response to the HPAI crisis in Asia. The purpose of a regional FETPV is to produce high-quality graduates who are problem solvers and can provide science-based recommendations for government decision makers. The development of a regional FETPV was based on the establishment of partnerships with national and international agencies and organizations as well as a program structure that includes a coordination and training center, curriculum development through a series of meetings and workshops, and related activities.

The regional needs assessment identified key competencies and skills required by veterinary field epidemiologists. The training curriculum consists of interdisciplinary training modules being developed for a regional FETPV, which include animal disease surveillance, investigation of outbreaks, data analysis, the animal–human–environment interface, geographic information systems, emergency preparedness and response, and market chain analysis.

As the principle of the regional FETPV is training through providing services, 75% of the trainees' time is spent in their home country conducting field studies. During the 2-year program, trainees must complete one secondary data analysis, one field research project, and four outbreak investigations as principle investigator. Field mentors play a critical role in providing trainees with sound skills while they are completing the course requirements. Mentors include skilled epidemiologists from FAO, epidemiologists from university faculties and other national and international organizations available at the country level, and regional FETPV epidemiology staff.

Training components developed for the regional FETPV—1-month and 2-year courses—are being applied as a regional resource for use in Cambodia, the People's Republic of China (PRC), India, the Lao PDR, Myanmar, and Nepal. The PRC and India are developing satellite FETPV training nodes that will collaborate closely with the regional FETPV.

Decision making using science-based evidence and a multidisciplinary approach

Although most national veterinary services were established many years ago, the vast majority have struggled to eliminate long-standing diseases and are poorly positioned and structured to address the growing challenges and opportunities. The effort to improve the technical and institutional capacities of national veterinary services requires time, strong alliances, and better international cooperation. Thus,

the immediate support that FAO has provided is to encourage member countries to use science-based evidence and a multidisciplinary approach to assist in making decisions for animal health policy and disease control planning.

Better understanding of the disease transmission risks, drivers, and impacts. Numerous livelihood and market chain studies in the region have generated a large body of information on gender and livelihoods impacts. Disease control policy options that balance the reduction of the risk of disease transmission with minimization of market and livelihood shocks are feeding into the animal health programs and livestock sector policy dialogue with member countries in the region. The focus on the microeconomic impact of production losses on the livelihoods of poor farmers provides information on the varying severity of the microeconomic impact in areas where poultry or swine farming is the main source of livelihood.

The poultry value chain studies completed in Indonesia, Myanmar, and Viet Nam have helped to identify chains and the points along the chains that pose high risks of spreading HPAI in these countries. One high-risk point along such chains is live markets, which are now the focus of possible government policy change. Such value-chain studies are being conducted at both the country and cross-border levels. The risks of HPAI transmission can be identified along the poultry production and market chain. Managing cross-border movement of animals and animal products has been recognized by countries as a vital intervention tool, and related zoning initiatives as well as bilateral and regional agreements are now being forged across the region.

Understanding wildlife and ecosystems of TADs. It is essential to understand the ecology of diseases and the interaction among pathogens, livestock, wildlife, and people to reduce the health impacts of emerging infectious diseases. It is necessary to focus on improving the understanding of disease reservoirs and spillover hosts among the sectors, determining risk factors that lead to pathogens moving between the sectors, defining critical points of contact among the sectors through improved wildlife ecology information on habitat use and movements, and increasing epidemiological knowledge that will facilitate the development of management actions and strategies to prevent disease transmission and minimize impacts when diseases emerge.

Specifically for HPAI, wild birds were tracked by satellite to study links with avian influenza. The activity aimed to gain a better understanding of the potential for wild birds to spread the virus. FAO has deployed more than 400 transmitters on 25 bird species categorized as high-risk for spreading HPAI. The study has been implemented in partnership with international, national, and local partners at multiple sites in the PRC; Hong Kong, China; India; and elsewhere. Data collected have been used to generate detailed migration maps, which can be compared with H5N1 HPAI outbreak locations to evaluate any role that wild birds may have in spreading the disease.

Strategic communication and advocacy for risk reduction. Along with its communication partners (including the World Health Organization [WHO], United Nations Children's Fund [UNICEF], OIE, World Bank, and others), FAO has reviewed the knowledge, attitudes, and practices in HPAI-affected and at-risk countries to understand better the underlying dynamics of communities' beliefs and behaviors, and to incorporate this knowledge into community-based approaches to strategic communication for preventing and controlling HPAI.

Innovative participatory communication interventions have been developed and are being carried out in Cambodia, Indonesia, the Lao PDR, and Viet Nam. These activities range from training of village animal health workers as communicators at the community level to community forums enabling community members to increase their capacity for decision making to combat avian influenza, to devising sustainable biosecurity measures for resource-poor settings by using participatory communication methodologies.

FAO recognizes the crucial role that the media can play in setting the global and national development and policy agenda. In addition to keeping the media informed through regular media releases and a website dedicated to avian influenza, FAO is piloting an innovative media fellowships program focusing on animal health issues and community voices in Indonesia and Viet Nam.

Best practices in TADs control

FAO has promoted best practices of disease prevention and control through the guidelines, recommendations, and manuals being produced by FAO experts. The key subjects being promoted as best practices include

- guiding principles for surveillance and laboratory diagnosis of animal influenza in Asia,
- preparation for HPAI,
- a manual for surveillance and outbreak investigation in wild birds,
- FAO biosecurity toolkits,
- good emergency management practices,
- a compensation strategy checklist, and
- good practices for biosecurity in pig farming.

In addition, SOPs for specific purposes such as outbreak investigation, sample collection, and international shipping and outbreak containment (including culling procedures and disinfection) have been developed in English and local languages to be used by the field staff as an operational manual. FAO and OIE are jointly harmonizing the SOPs for investigating outbreaks at the country level for Cambodia, Lao PDR, and Viet Nam. The SOPs have been included as training materials for CAHWs in these countries.

Action areas

The trend toward increases in livestock production and animal numbers in Asia will almost certainly continue and, although regulatory systems will improve, porous borders, changing industrial structures that necessitate increased animal movements, and ever-increasing linkages in cross-border supply chains will remain incentives for informal cross-border trade. The presence of nearly 1.5 billion cattle and buffalo, 900 million pigs, nearly 1.9 billion sheep and goats, and 17 billion poultry has amplified the significant animal health risks posed by animal movements. In this situation, a small animal disease outbreak can quickly turn into a full-scale epidemic.

These challenges require continuing and significant investments in locally available human skills and institutions, and the implementation of rigorous and organized programs that use epidemiology and economic research to assist in decision making. Regional coordination is needed to combat TADs and emerging infectious diseases.

To achieve effective control of TADs through regional collaboration and cooperation, the following recommendations are proposed:

- Establish a regional support unit in South Asia and another in Southeast Asia, in Nepal and Thailand, as agreed upon by the subregional groups—the South Asian Association for Regional Cooperation (SAARC) and the Association of Southeast Asian Nations (ASEAN). The goal of the units will be to foster and develop a regional coordination and cooperation mechanism to combat TADs. The units would be responsible for formalizing regional collaboration and developing a cooperative regional framework to support the generation of common regional policies and regulations governing animal movements and information sharing.
- Develop regional reference diagnostic laboratories in the two subregions to provide reference diagnostics, standardization of diagnostic reagents, and tests for priority TADs, as well as to coordinate and manage networks of national diagnostic laboratories.
- Establish regional epidemiology units staffed by multidisciplinary teams to coordinate and manage networks of national surveillance teams; facilitate policy dialogue; establish regional policies to control TADs; provide training such as epidemiological tools and methods; and facilitate policy harmonization, animal movement protocols, and disease control programs.
- Develop tailor-made disease risk-mitigation approaches through the food chain for each subregion. These approaches will incorporate the economic dimension of disease control, foster animal health, enhance food safety and quality along the food chain, and support the development of safe animal trade and disease control by identifying the numerous factors that determine the patterns of animal movements and links between farming systems and markets. Building mechanisms for ensuring healthy animals along the food

chain should combine knowledge and the use of economic incentives and regulatory requirements for animal health certification at places of slaughter and markets.

- Call on countries to contribute financial and human resources to develop the centers and commit to developing effective systems for the prediction, early detection, and structured risk-based animal disease surveillance, leading to early warning of disease outbreaks.
- Support the development of long-term strategic and integrated approaches to animal disease control that recognize the importance of regional collaboration and the establishment of regional support units in SAARC, ASEAN, and the Secretariat of the Pacific Community.
- Acknowledge that animal disease is a broad economic and human health issue that requires wide-ranging and innovative approaches to disease control. The approaches should build on a solid understanding of the drivers of animal and animal product movements, an appreciation of the important role played by livestock in rural economies, and the need to review the economic and regulatory environment supporting disease control.

References

Delgado, C., M. Rosengrant, H. Steinfeld, and S. Ehui. 1999. *Livestock to 2020: The next food revolution*. Washington, DC: International Food Policy Research Institute (IFPRI), Food and Agriculture Organization (FAO), and International Livestock Research Institute (ILRI).

Food and Agriculture Organization (FAO). 2009. *Statistical Yearbook, 2009*. Rome.

_____. Agriculture Department, Animal Product and Health Division. EMPRESTADs. http://www.fao.org/ag/againfo/programmes/en/empres/diseases.asp.

Tung, D. X., and N. T. Thuy. 2007. *Economic impact assessment of FMD on smallholder farms in Northern Viet Nam*. Report on GCP/RAS/206/ASB TADs control in the GMS. Asian Development Bank, Food and Agriculture Organization of the United Nations, Rome, 1–39.

Chapter 8

Innovative financing for food security

The Asia and Pacific region has emerging financial products and services for financing activities related to food security. The products and services may also address the numerous market imperfections and uncertainties, such as adverse weather, that affect small-scale farmers, small- and medium-scale food service providers, and other agribusiness entities in the food chain. This chapter, which correlates with Session 5 organized by the International Fund for Agricultural Development (IFAD) in the Investment Forum, presents a study of financing schemes to mitigate the impact of high risks and high transaction and supervisory costs in rural credit markets.

Innovative solutions show the way

Lending a helping hand to rural producers

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Innovative financing schemes are being developed across the Asia and Pacific region to create an enabling market environment for private sector investments in food production

The world faces a food security problem. The World Bank's *2008 World Development Report* called for greater investment in agriculture in developing countries if the goals of halving extreme poverty and hunger by 2015 are to be realized. A Food and Agriculture Organization (FAO) conference in 2008 stressed that food security was one of the biggest challenges of the century, noting that increased agricultural investment and enhanced productivity are crucial (OECD–FAO 2009).

Discourse on food security has revolved around securing arable land for crop cultivation, reducing input costs, opening the food markets, and providing the poor and vulnerable with food safety nets. Governments use instruments such as taxes, subsidies, fiscal incentives, and other measures to motivate food production.

In many developing countries, small-scale farmers or shareholders produce rice, maize, and other staple products for the vast majority of the population.

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Private business invests in cash crops, e.g., sugarcane, rubber, palm oil, and coffee, destined for the export markets. This is not to say that there are no incentives to invest in food production, as real food prices are expected to remain high in the future, but the absence of an enabling framework and disincentives to food production discourage private sector investments.

A key issue for stimulating food production is access to agricultural finance, which is constrained by two major factors: (1) high risk, including covariant risks (risks that may affect a large number of insured people or items at the same time); and (2) high transaction and supervisory costs. Price fluctuations, extreme weather events, pests, and diseases affect crop production. Asymmetric information, ill-defined property rights, costly land registration, and the absence of insurance and equity markets are well-known barriers in rural credit markets. The dispersal of the rural population over a vast area, and poor transport and communication infrastructure, result in high transaction costs and expensive loan supervision relative to lending to urban borrowers.

Without access to formal agricultural finance, rural producers tend to concentrate on low-risk, low-return activities, resulting in limited investments in the agriculture sector and food production. The challenge to financial institutions and policy makers is to address the twin problems in rural financial markets of high risks and high transaction costs and loan supervision costs.

This paper focuses on innovative financing schemes for food production that could be used by both the government and private sector in making more investments in food production. The schemes show particular approaches that can surmount the twin problems. Supporting and promoting such schemes could be an important part of creating an enabling environment for private sector investments in food production.

Innovative approaches and practices

The innovative financing schemes discussed in this paper seek to mitigate the impact of high risks and high transaction and supervisory costs in rural credit markets. The schemes are grouped into (1) value-chain financing, (2) risk management tools, and (3) credit delivery mechanisms. Common to these schemes is their potential to reduce the risks and costs of lending to agriculture, thus enabling rural producers to access the formal financial markets.

Value-chain financing

Each link in the chain adds value to a final product, beginning with production and continuing through processing, marketing, and sale to the end-user. Value-chain financing reduces commercial risk by providing an assured market for the end product, making it easier for chain actors to obtain financing. Efficient value-

chain financing enables rural producers, traders, and processors along the chain to optimize financial investments, resource allocation, and capacity expansion.[2]

Innovations in rural credit markets that can be introduced in the value chain are (1) warehouse receipts, (2) contract farming arrangements, (3) trade finance, and (4) other commodity finance instruments. The ensuing value-chain financing uses "interlinked transactions," wherein one transaction (e.g., a loan for the purchase of inputs) is usually linked with another (e.g., sale of outputs) as a condition for the loan. Efficiency gains arise from connecting the two separate transactions and from the innovative use of such interlinked transactions as a substitute to traditional collateral.

Warehouse receipts. Upon deposit of produce at the warehouse, producers and traders are issued a receipt certifying secure and safe storage of the goods for a specified period of time (Figure 1). The warehouse receipts can serve as collateral for bank loans, because lenders have prior claim to proceeds from the sale of the produce, should the borrower default (Onumah 2003).

Other players have equally important roles: (1) inspection and licensing services, and (2) insurance services. These services assure that certified warehouses meet standards for safe and secure storage, and protect depositors and lenders against losses due to disaster and/or criminal activity (Onumah 2003). The implementation of "standards" is key to the effectiveness of this scheme.

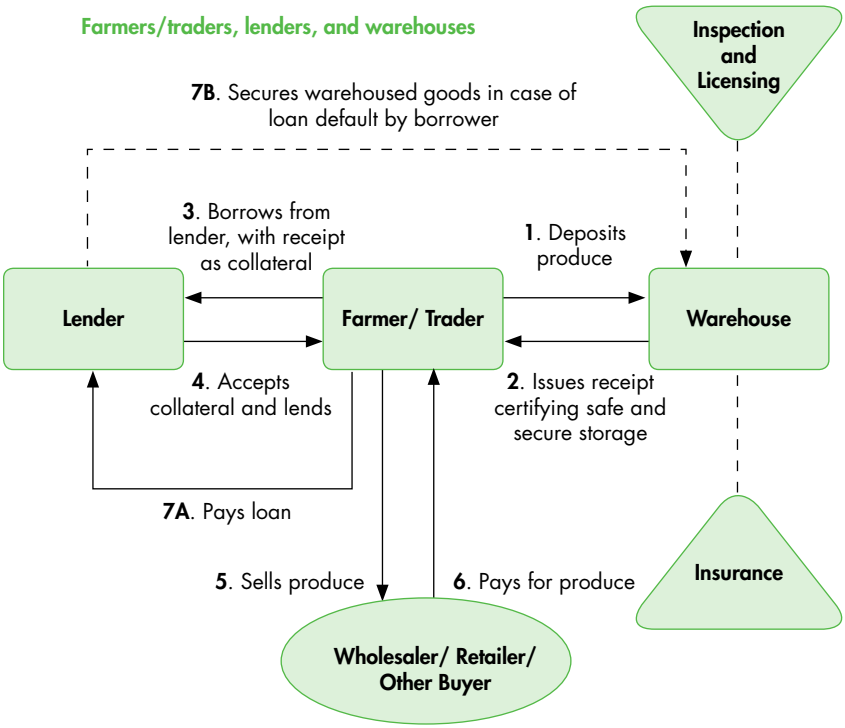
Warehouses may function as a sort of credit bureau to a limited extent by building a third-party history of the performance of depositors. This indirectly provides banks with critical information on depositors–borrowers.

Because of the easy recourse and the ability to sell a liquid collateral asset in case of default, lending based on warehouse receipts lowers credit risk and reduces high loan servicing costs due to limited volumes, high information costs, and high supervision costs. Borrowers do not need a balance sheet or long credit history, because the lender relies on the value of the warehoused commodity. The reduction in information and loan supervision costs helps reduce interest rates for borrowers. A transaction backed by a warehouse receipt allows a lender to shift risk away from the borrower to a liquid asset and, in some cases, to even enhance it further through the creditworthiness of a strong off-taker (contractual buyer of production) (World Bank 2007). Thus, warehouse receipt financing creates opportunities for the private business sector on the lookout for feasible financing approaches to address food security challenges.

The Philippines has extensive experience in inventory credit using warehouse receipts. Warehouse operators accredited by the government-owned Quedan and

[2] The Equity Bank of Kenya operates a project launched in 2007 that provides $50 million and other financial services to Kenyan farmers, agricultural input dealers, and other players in the agricultural value chain. IFAD and the Alliance for a Green Revolution in Africa provided a $5 million cash guarantee fund to reduce the bank's risk. The Kenyan Ministry of Agriculture provides vouchers to poor farmers, which they use to purchase inputs from agricultural input suppliers (IFAD 2008; World Economic Forum 2009).

Figure 1: Actors and transactions in the warehouse receipt model



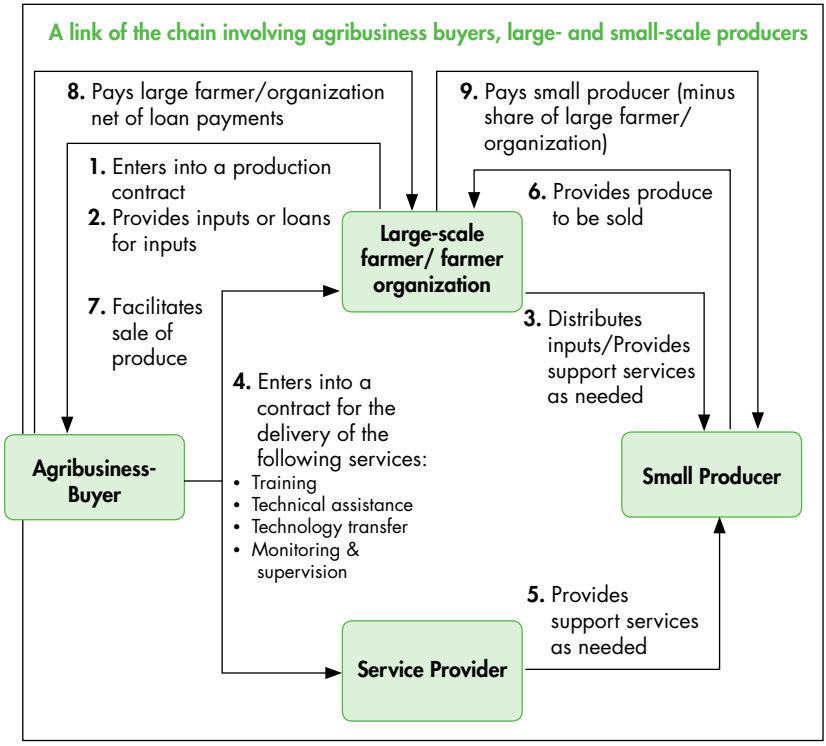
Rural Credit Guarantee Corporation (QUEDANCOR) issue warehouse receipts to farmers and traders, who deposit their grain stock in bonded warehouses. The warehouse receipt and stock inspection report of QUEDANCOR are presented to a bank in exchange for a loan. QUEDANCOR guarantees the loans granted by banks.

Contract farming arrangements. A large agribusiness firm enters into a purchase contract with organized small-scale producers for the commercial production of a certain commodity with specified standards of quality and quantity. The buyer facilitates the financing, which can be provided by the firm itself or a bank, and provides inputs to farmers. Producers also receive technical assistance, training, and technology transfer, and they are monitored and supervised. Tying the loan to a purchase agreement reduces loan default risks, because producers

have a ready market for the produce.[3] The financial institution provides the funds for production based on the purchase agreement. The buyer deducts the loan repayment from the proceeds of the sale of the produce and remits to the lender. The purchase agreement or contract between the producer and buyer serves as a collateral instrument to secure the loan.

Figure 2 illustrates the scheme that is widely used in Asia, especially in the Lao People's Democratic Republic (Lao PDR), the Philippines, Thailand, and Viet Nam in the livestock, poultry, and high-value crop industries.[4]

Figure 2: Actors and transactions in the contract farming model



[3] Gonzalez-Vega, Quiros, and Rodriguez-Meza (2006) report farmers being able to obtain formal loans to finance production because of production contracts between the farmers and a supermarket.

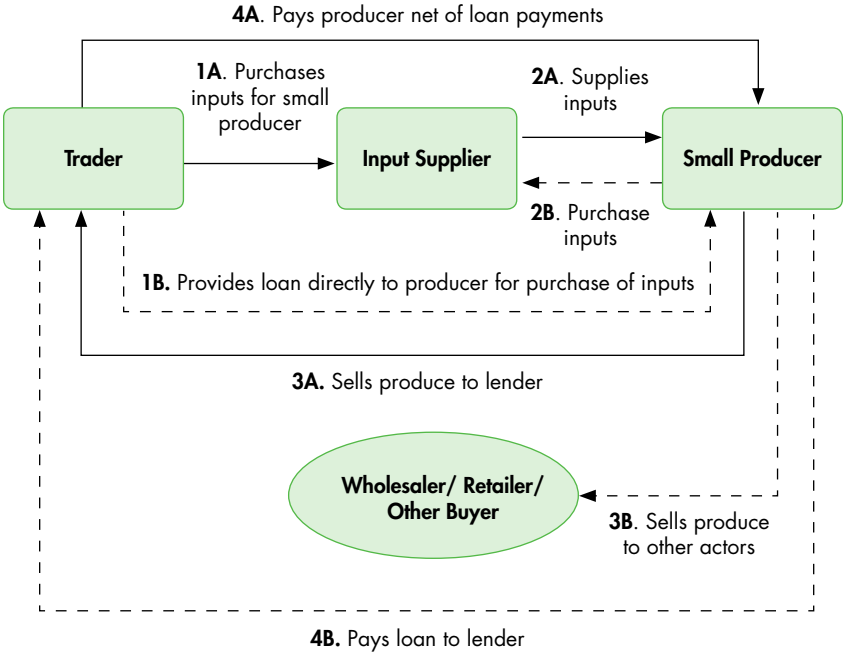
[4] To increase its supply of high-quality maize in the People's Republic of China, General Mills switched from imports to local supply and saved on procurement costs by 25% in the process. The company buys maize for the Chinese version of its Bugles snack from 528 small farms in Yongqing Village, Heilongjiang Province, after partnering with a local miller, Xingda, which provides logistical support and manages community relationships (World Economic Forum 2009).

Trade finance. Traders either purchase farm inputs from input suppliers and provide these to small-scale producers or provide cash to producers to purchase inputs, although the former is preferred to avoid loan diversion. Producers may or may not be bound by a purchase agreement; if not, they may either sell their produce to traders upon harvest—with payment for the loan deducted from the sales proceeds—or sell it to other buyers such as wholesalers or retailers (Figure 3). Familiarity with borrowers, the limited area of operation, and a good understanding of the business environment bring down the transaction costs of traders.

Rural producers have timely access to credit with fast processing and release of loans. The drawback is that traders may either charge very high interest rates or offer a very low buying price for their produce. The scheme is basically informal and unsupervised, and interest rates and prices are flexible.

Figure 3: Actors and transactions in the trader finance model

A link of the chain involving traders, input suppliers, and small-scale producers



Note: Broken arrows represent alternative transactions among actors in the chain.

Other commodity finance instruments. More sophisticated financial markets have some other forms of collateral financing instruments such as the following (World Bank 2005):

- **Repurchase agreements.** Repurchase agreements are simple forms of commodity finance: The bank, rather than taking a pledge over the goods being stored or shipped, actually buys the goods and simultaneously signs a contract for resale at a certain point in time and at a price that reflects the cost of funds from the original time of sale to the resale.
- **Export receivables financing.** Funds are disbursed to an exporter against assigned off-take contracts of commodities. In an example in Argentina, the exporter assigned its receivables to a local bank, which acted as an agent. The International Finance Corporation (IFC) and a syndicate disbursed funds to the agent bank, which in return disbursed funds to the company for working capital purposes. The off-taker, hence importer of the exported commodities, paid for the purchase directly to the agent bank, which in return serviced the IFC loan out of these proceeds (World Bank 2007).
- **Factoring.** A supplier assigns receivables from contracts of sales of goods made between the supplier and a customer to a factor. The factor provides finance to the supplier through loans and advance payments. As a result, a supplier can sell its creditworthy accounts receivable at a discount in order to receive immediate cash and hence get immediate financing for working capital. Factoring shifts the risk away from a potentially high-risk supplier—that needs the financing—to a low-risk off-taker, who stands behind the accounts receivable.

Risk management tools

These are tools that directly reduce the risk of lending to agriculture or the rural borrowers, thereby encouraging investments in food production.

Index-based weather insurance. Index-based insurance products for agriculture are an attractive alternative for managing weather risk. Pilot programs in several developing countries (such as India, Malawi, Mexico, Mongolia, the Philippines, Tanzania, and Thailand) have proven the feasibility and affordability of such products. In index-based weather insurance contracts, estimates of financial losses are based on an index instead of the actual losses of each policyholder. The index could be based on variables such as regional rainfall, wind speed, temperature, regional area yields, or regional livestock mortality rates. The insurance provider starts compensating policyholders for losses when the index passes a predetermined critical threshold. Payments increase incrementally as the index deteriorates, and policyholders receive the maximum amount possible when a predetermined upper limit is reached.

Efficient weather insurance indexes eliminate moral hazard and adverse selection, because the policyholders cannot influence the changes in the index, and both the provider and the policyholder have the same knowledge of the likelihood

of the shifts in the index. Such indexes also greatly decrease monitoring and administration costs, because actual losses do not need to be calculated, thereby eliminating common risks. Pilot tests in many developing nations have highlighted the affordability of this instrument to poor farmers without need for subsidies.

The main limitations of index-based weather insurance contracts, however, are that they cover only a portion of the exogenous risks facing farmers. Price fluctuations and other risks, such as unmanageable pests or nonavailability of inputs, cannot be managed with this instrument. There is also the need for easily accessible and reliable weather information, which may be a problem in developing countries. This instrument has to be supported by substantial investments in information and technology.

In contrast, traditional crop insurance programs often exclude systemic weather factors such as drought. The basis for payouts is the extent of loss after a calamity, which is determined through costly and time-consuming individual farm visits. Traditional crop insurance suffers from moral hazard and other negative outcomes due to information asymmetry. Moral hazard leads to higher premium rates; highly trained loss adjusters are also required to ensure that programs are controlled and sustainable. Given these costs, traditional crop insurance is typically heavily subsidized.

A review of 37 index insurance ventures in 15 countries conducted by the World Food Programme (WFP) and the International Fund for Agricultural Development (IFAD) reported a number of important lessons for viable index insurance schemes (Hess and Hazell 2009):

1. **Distinguish between two fundamentally different objectives affecting the design and delivery of index products.** These are (1) subsidized schemes, which help poor people protect their livelihoods and assets (i.e., protection insurance); and (2) unsubsidized schemes, which help viable farm businesses manage their risks (i.e., promotion insurance).
2. **Focus on the real value proposition for the insured.** For protection insurance, products should be timely, credible, and a fair relief in times of crisis; promotion insurance products should catalyze access to credit, technology, or new markets and help generate significant additional income.
3. **Find a champion to overcome initial set-up problems and barriers.** An outside agent could act as a champion to motivate the implementation of a program despite initial problems. Examples of these champions are multinational agencies such as the World Bank (for India, Malawi, and Mexico) and the WFP (in the People's Republic of China and Ethiopia); nongovernment organizations (NGOs), such as Oxfam in Ethiopia; and brokers such as MicroEnsure in Tanzania. The support could be through provision of public goods (e.g., weather stations and insurance regulations) and/or the establishment of reinsurance arrangements.

4. **Develop efficient and trusted delivery channels.** Promotion insurance should be provided by efficient, responsive, and reputable institutions.
5. **Develop weather data infrastructure.** The insurance market must be supported with reliable data on risk as well as index values.
6. **Transfer risk to international markets.** It is crucial to have reinsurance support in the development and scaling up of index insurance.
7. **Train all implementation actors.** Index-based insurance programs that have a training and capacity development program as a component have a greater advantage than those that do not.

Hess and Hazell (2009) recommend the following:

- building weather station infrastructure and data systems, and making the data publicly available on a timely basis;
- providing an enabling legal and regulatory environment;
- financing agrometeorological research for product design and making the results publicly available;
- educating farmers about the value of insurance and workings of index-based products;
- facilitating initial access to reinsurance;
- supporting the development of sound national rural risk management strategies that do not crowd out privately provided index insurance;
- subsidizing protection insurance where it is more cost-effective than existing types of public relief, and using smart subsidies when needed to kick-start promotion insurance markets; and
- supporting impact studies to systematically learn from ongoing index insurance programs and to demonstrate their economic and social benefits.

Index-based livestock insurance. Index-based livestock insurance is determined by an index that is highly correlated with a particular livestock mortality rate due to harsh climate. The use of this index decreases the administrative and transaction costs for identifying losses and limits the influence of the insured in affecting the outcome, since the index is independent of individual actions. Index-based livestock insurance thus reduces moral hazard and adverse selection. Indemnities are paid whenever the adult mortality rates exceed a specific threshold for a certain locality. Individual herders who take good care of their animals are paid after a calamity despite minimal loss, as an incentive or reward for their extra effort in protecting their herd. There is extensive experience in Mongolia with this type of insurance.

Guarantee scheme. Typically, a government corporation or agency guarantees a portion of the loans extended by banks to eligible clients, usually small-scale farmers. The Philippine loan guarantee program guarantees up to 85% of the outstanding loan of a small-scale farmer.

Proponents indicate that the following justify its use: (1) lender emphasis on collateral, because most small-scale borrowers do not have the traditional collateral

to offer; (2) when the high fixed cost of due diligence (relative to loan size) makes it uneconomical for lenders to extend small loans; and (3) when lenders think a guarantee scheme gives an excellent opportunity for partnership between the public and private sectors.

Christensen et al. (1999) reported that loan guarantee schemes of various designs were in effect in 85 countries. Reports are mixed with regard to the schemes' effectiveness in terms of increasing access to credit for borrowers such as small-scale farmers and micro and small enterprises. Nevertheless, the following new features are being adopted to encourage bank lending:

- provision of a loan portfolio guarantee instead of the traditional loan guarantee for individual borrower loans;
- in addition to banks, other institutions such as cooperatives, small and medium enterprises (SMEs), NGOs, and farmers' organizations can seek guarantee coverage;
- a guarantee can cover all risks, including those caused by natural calamities and by pests and diseases (except fraud by the lender);
- a guarantee may cover all types of agricultural activities, e.g., grain production, high-value crops, poultry and livestock, and fishpond operations; and
- lower risk weights are given on loans covered by guarantee schemes to satisfy central bank requirements.

Microinsurance. This instrument was developed to reduce the risk of lending to the poor. Two microinsurance products are often bundled with microcredit:

- **health insurance,** to help the poor cope with debilitating illnesses and improve health in low-income households, and therefore to reduce mortality; and
- **life insurance,** to assist in case a household's main breadwinner dies, which can severely impact household welfare; if well designed, life insurance can mitigate the financial shock of this death by providing income assistance to the family and/or by covering funeral expenses.

Life insurance is the most popular microinsurance product in low-income markets, followed by health insurance. However, market penetration is much lower than would be expected. A study of the microinsurance market in Africa estimated that life insurance covered only 2% of its potential market, while health and agriculture insurance services barely reached 0.3% and 0.1% of the low-income population, respectively (ILO 2009). Reasons for such low coverage may include that (1) the poor are asked to pay cash up front to an institution in order to receive insurance benefits conditional on the occurrence of a particular event, e.g., death of the insured, whereas in microcredit a financial institution provides a loan to the borrower on the condition that it be repaid at a later period; (2) insurance is a difficult concept for the poor to comprehend, given its cost and novelty; and (3) given their limited experience with insurance, establishing trust in insurance products among the poor is difficult. The microinsurance industry faces significant challenges, such as making premiums affordable to the poor, high transaction

costs, lack of reinsurers' interest in this market, and limited information on the target market (Llanto 2007).

To extend affordable insurance to low-income households, new insurance products should be developed and effective delivery channels explored. These should be supported by substantial investments in information and technology as well as investments that reduce the risks faced by poor households, e.g., low-cost irrigation schemes, drought-resistant seed varieties, improved water supply and sanitation, and better preventive health care.

An innovation to promote insurance among the rural poor is community-based health insurance schemes that pool risk to cover health care costs. The community-based insurer can monitor behavior and enforce contracts and reach clients overlooked by many formal insurance schemes, and thus address adverse selection problems. This lowers the retail cost, which allows affordable insurance to be provided. However, community-based health insurance has some disadvantages, such as the relatively small size of the insurance portfolio, limited technical and managerial skills, and inaccessibility of service providers. There is also concern about small risk pools and dependence on subsidies.

A review of case studies in India, Rwanda, Senegal, and Thailand draws the following lessons (Drechsler and Jutting 2005):

- Viable and high-quality services are needed to encourage people to pay premiums.
- Socioeconomic and cultural factors play an important role in determining the market for health insurance, e.g., the target population needs a good understanding of insurance.
- Microfinance institutions could play a vital role, given their experience in providing financial services and social protection.
- Creative and flexible payment options encourage more poor people to insure. In Rwanda, groups set up a system where households used a savings and loan association to save enough money to join a prepayment insurance scheme. Other groups established lotteries and started collective activities to earn money to pay for membership fees.

Calamity relief. Governments in developing countries may establish a calamity fund that provides subsidized or interest-free loans to farmers and fishermen affected by flooding, drought, and other extreme weather conditions. This is to enable farmers and fishermen to recover from losses and repay previous loans. India's Vulnerability Reduction Fund has one of the best calamity and disaster relief mechanisms among developing nations.

Credit delivery mechanisms

Innovations to make financing available even in remote areas include (1) schemes that link formal financial intermediaries with informal financial intermediaries, (2) wholesale lending approach by big banks, and (3) use of information and communications technology (ICT).

Schemes linking informal and formal financial intermediaries or tapping informal financial institutions as conduits or direct links to the poor. Such schemes link banks with target households through informal institutions. The banks provide the funds for lending, and the informal institutions (1) organize the rural borrowers, monitor their progress, discipline members especially on the use of credit and on loan repayment, and promote savings and other noncredit financial services of the bank; (2) provide training and technical assistance on business or enterprise development; and (3) link the borrowers–clients to viable markets in the supply chain. Some successful schemes include the following:

- **India's self-help groups and linkage banking.** Self-help group (SHG) banking helps promote financial transactions between banks and informal SHGs (Kropp and Suran 2002). The SHGs make voluntary savings on a regular basis, which they use together with bank loans to extend interest-bearing loans to members for production, investment, or consumption activities.

  The three models of the SHG bank linkages are (1) SHGs formed and financed by banks (16% of all SHGs); (2) SHGs formed by NGOs or government agencies but financed by banks (75% of all SHGs), where the bank provides the credit after preparation work of a government agency or an NGO; and (3) SHGs financed by banks using NGOs as intermediaries (9% of all SHGs), where the NGOs both facilitate group formation and act as credit conduits.
- **Linkage banking with farmers in Viet Nam.** Under a joint resolution between the Vietnam Bank for Agriculture and Rural Development (VBARD) and the Central Farmers' Union signed in 1999, borrower–savings groups of 5–7 members were formed. VBARD disburses the group loan and the farmers' union assists the group with the loan application assessment, debt repayment, etc. VBARD covers the operating fees of the farmers' union; provides training on borrowing procedures; and invites agricultural organizations to lecture on cultivation, aquaculture, etc.
- **Linkage banking with Cambodia's village associations.** Amret, a leading Cambodian microfinance institution, employs a group lending scheme through village associations. Several groups of five members form a village association. The village association functions as intermediary by borrowing from Amret and lending to members.
- **Helping fisherfolk in Tamil Nadu, India.** The South Indian Federation of Fishermen Societies was tapped to manage a debt redemption fund for fishers, which provides refinancing to allow them to repay debts from traders and middlemen. To benefit, the fishers have to be members of a fishers' society registered with the federation.
- **Improving market access through cooperative strengthening in the People's Republic of China**. This program to build market access helps develop capacity within cooperatives in Henan Province. Members are

linked to domestic and international markets and are provided with business development services to improve the quality of their products and to make them participants in the value chain.

Wholesale lending. Banks may provide wholesale financing to retail lending institutions which, in turn, lend to end-borrowers. The wholesale banks may provide support services, e.g., capacity development to help retail institutions such as cooperatives become viable financial intermediaries. The Land Bank of the Philippines has vast experience providing funds and capacity development to its network of retail institutions.

Use of information and communications technology. Financial institutions are increasingly using ICT to improve business processes (e.g., loan appraisal and monitoring) and reach clients (e.g., using SMS in payment services). The use of debit, credit, and smart cards has reduced the transaction costs of rural clients significantly. Some obstacles to widespread adoption of electronic cards in rural areas are (1) unreliable electricity and telecommunications service; (2) unreliable postal services, which complicates billing and payment processes; (3) nonexistent credit bureaus, or bureaus that report only negative information of limited duration, mostly on large firms and urban wage earners; (4) low levels of education in rural areas of developing countries; and (5) the use of competing and incompatible networks and proprietary standards, which limit client access to the machines of the issuing institution.

In the Philippines, the privately-initiated B2Bprice.com project supported by the Land Bank introduced e-commerce among cooperatives and farmers. B2Bprice.com is a free electronic bulletin board and marketplace designed to bring relevant market information to cooperatives. As an electronic marketplace, B2Bprice.com minimizes market intermediation costs, thereby allowing the farmers to make gains and reach broader markets.[5]

Philippine rural banks have started to use mobile phones in providing microfinance services under the "Text-A-Withdrawal" program. The mobile phones use GCASH, a mobile money platform of a Philippine telecommunications company. Launched in 2004, GCASH turns mobile phones into "virtual mobile wallets." GCASH can be converted to cash to pay for goods, services, and bills, and to serve as remittances. The mobile phone services use SMS messaging in these transactions.[6]

Kenya Agricultural Commodity Exchange, an agricultural service provider, facilitates trade by providing a venue to find the prices of more than 42 commodities

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[5] Based on an interview with an executive of the Land Bank, 3 years after B2Bprice.com was launched, 1,600 cooperatives had made postings with the total value amounting to $60 million.

[6] There are more than 1,800 authorized cash-in/cash-out outlets in the Philippines. From January to August 2007, rural banks processed 87,900 transactions totalling $7.7 million (see the Mobile Phone Banking for Clients of Rural Banks website, www.mobilephonebanking.rbap.org).

in 10 regional markets through several channels. The Exchange provides kiosks where buyers and sellers can place offers and bids for a fee (World Economic Forum 2009).[7]

Lessons for replication and policy options

This paper focuses on financing innovations that could lead to more investments in food security. The innovations can address high risks and high transaction and loan supervision costs (Table 1).

Table 1: Lending constraints addressed by innovative financing schemes

Innovative Financing Scheme	Mitigating High Risks	Reducing High Transaction and Loan Supervision Costs
Value-chain financing		
Warehouse receipts lending	✓	✓
Contract growing/farming	✓	✓
Trader finance	✗	✓
Other instruments (repurchase agreements, export receivables financing, factoring, etc.)	✓	✓
Risk-reducing instruments		
Index-based weather insurance	✓	✗
Guarantee schemes	✓	✗
Credit delivery structures		
Linkage banking	✗	✓
Wholesale lending by big banks	✗	✓
Use of information and communications technology	✓	✓

Note: ✓ = mitigates risk or reduces transaction costs.

The discussion of innovative financing schemes underscores some key lessons regarding the role of the government and private sectors in lowering costs and risks in the rural finance space:

- In developing countries, a prevalent mode of financing is the trader credit model, which enables small-scale producers without direct linkage to and information about the market to secure inputs, produce, and sell their

[7] The kiosks are used by about 24,000 farmers and generate $5,000 a month in trading volume. At one of the markets (Bungoma, Nyanza Province), farmers who used the kiosks were able to realize prices 22% higher than those who did not use such kiosks (World Economic Forum 2009).

produce through interlinked transactions. However, small-scale producers do not necessarily get the full benefit from such transactions.

- The value chain provides a convenient avenue for directly linking diverse actors in the supply chain to generate the outputs needed by the market. Both governments and private enterprises can facilitate contractual arrangements that directly link farmers to large companies, an approach that will enhance the value chain and improve the lot of small-scale producers. The traders or middlemen will not necessarily disappear from the supply chain, because they may be able to continue their role in interlinked transactions where no direct links materialize between small-scale producers and large companies. Traders and middlemen may also provide consolidation and marketing services for small volumes of outputs from small-scale producers. The important activity is providing small-scale producers with the option for direct or indirect linkages. Direct linkages with buying companies or supermarkets will provide competition to traders, who may not be offering the best prices to small-scale producers. Participation in the value chain can also connect farmers and other small-scale producers to technology and market information.
- Contract farming is an emerging trend but often still lacks formal financing in the supply chain. Inputs, financing, and a market for the produce may be provided to rural producers by the large company. However, producers could have lower borrowing costs if financial institutions could be enticed to lend on the basis of a formal purchase contract between the producer and the corporate buyer. This is akin to commercial bank financing of export receivables. In the Lao People's Democratic Republic (Lao PDR), insufficient financing at the postproduction stage prevented a corporate buyer from procuring all of the produce, forcing farmers to sell elsewhere below market prices.
- In countries such as the Lao PDR and Viet Nam, state-owned enterprises directly compete with the private sector, which crowds out private enterprise and investments. Moreover, through state-owned enterprises, some governments intervene in agricultural product pricing to reduce price fluctuations or to provide a floor price. The World Bank (2005) notes this can be very costly, is often ineffective, and preempts development of insurance and storage markets. Farmers will not hedge their production if there is a floor price. Since producers have little incentive to store crops if they do not expect prices to rise over time, the market for storage facilities (and therefore the emergence of a warehouse receipts system) will be suppressed because price movements are inhibited by government intervention.
- Traditional crop insurance schemes that are heavily subsidized by the state should be reexamined. Moral hazard and adverse selection typically arise due to such schemes, because farmers may take excessive risks or collude with appraisers on overestimating crop damage to get undeserved benefits. The

absence of private investments in crop insurance may be due to distorted incentives.[8] When there is incentive compatibility,[9] private investments tend to flourish, as indicated by the case of BASIX's index-based weather insurance in India, which has grown despite competition from a subsidized government insurance program. BASIX's innovative private weather insurance product and lending tied to insurance offer a pathway to deal with weather-related risks in agriculture.

- Opinions on the efficacy of loan guarantee schemes are mixed. One view is that such schemes are not effective instruments for reducing credit risks and that the guarantee fees only add to small-scale farmers' borrowing costs. The contrary view is that banks seem to have been encouraged to lend to borrowers who can access loan guarantee schemes. A rigorous impact assessment of this risk-reducing instrument is needed. Because the Philippines' Agricultural Guarantee Fund Pool has been implemented for less than 2 years, it may be too early to determine its effectiveness and efficiency as a redesigned guarantee scheme.
- An enabling environment is crucial for the development of warehouse receipts, various collateral mechanisms, and supply chain financing. Developing countries suffer from the absence or weaknesses of institutions for contract enforcement and dispute settlement. The experience of the Philippines with warehouse receipts shows it is critical to ensure quick and timely settlement of claims, and have secure and bonded warehouses to store the produce, in order for banks to accept warehouse receipts as a worthy collateral substitute. If the property rights of a warehouse receipts system are weak or unclear, legal disputes are bound to arise as challenges are raised concerning their validity as collateral, their transferability, and their liquidity.
- Investments in technology can be costly unless justified by good financial margins for the investing institution. The World Bank (2005) suggests sharing infrastructure such as power, telecommunications, data networks, hosting, application support, or data management as a way to leverage the technology investments, possibly reducing investment costs. The same leveraging could be applied for investments in physical infrastructure and facilities, e.g., weather stations, all-weather roads that improve food supply chains, etc. There is scope for public–private sector partnerships in

[8] Delays in claim settlements and nontransparent procedures for payouts of insurance claims discourage private investment.

[9] Incentive compatibility—a characteristic of mechanisms whereby each agent knows that his/her best strategy is to follow the rules, no matter what the other agents will do—is desirable, because it promotes the achievement of group goals. But it is elusive, because pervasive opportunities exist for misbehavior, such as by misrepresenting preferences (Ledyard 2008).—Ed.

providing infrastructure facilities that serve both public sector goals and private sector profit objectives.

- Financial innovations and technologies for risk reduction and management require investments in capacity development for private providers and government agencies. There is also a need to educate borrowers, mostly rural producers, on new lending approaches, financial innovations, and instruments for risk management.
- Governments in developing countries require assistance in crafting an enabling environment and regulatory framework for innovations in financing. The assistance includes capacity development for government regulatory institutions and assistance in drafting appropriate legislation and regulations.

Based on the key lessons, the study recommends the following:

1. Governments should focus on creating an enabling environment for the financial markets and provide the infrastructure and support services needed to develop capacities in the rural areas. This will lower transaction costs and facilitate the flow of finance along the supply chain.
2. Governments and the private sector should work together to address the information asymmetry that constrains financial markets, e.g., establishment of credit information bureaus. Rural small-scale producers lack credit histories that banks need to assess creditworthiness and risks.
3. Governments and the private sector should work together in developing and improving risk-reducing instruments, e.g., index-based rainfall insurance, which is underprovided in the market. Governments should also address barriers to long-term finance in rural financial markets. Financial institutions in developing countries have not yet devised appropriate long-term instruments to finance investments in equipment and machinery, transport equipment, storage, mills, and other processing and postharvest facilities. Most loans are for short-term working capital and production.
4. Governments should encourage the organization of farmers and other rural producers and assist them with capacity development to help them exploit opportunities in the food supply chains. Financing for processing and marketing is crucial for the growth and expansion of supply chain products from local to international markets.
5. Government and the private sector should work together to improve the warehouse receipts system if one is available in the country, or to consider developing a warehouse receipts system or a similar system through better monitoring of quality standards, more effective regulation of warehouses for storage of agricultural produce, coordination with financial institutions on requirements for accepting the receipts as collateral, and their transferability and liquidity.

6. Governments and the private sector can work together to develop and test effective credit delivery structures using ICT innovations that can lower transaction and loan supervision costs. The emphasis on building inclusive financial systems should increase. Financial literacy, design of financial products and services responsive to the needs of the rural population, and building of sustainable rural financial institutions are some of the activities that complement attempts to improve credit delivery structures in rural areas.

References

Asia–Pacific Rural and Agricultural Credit Association (APRACA), www.apraca.org.

Asian Productivity Organization (APO), www.apo-tokyo.org.

Campbell, R. 2008. Value Chain Framework Briefing Paper. Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance (ACDI/VOCA), funded by the United States Agency for International Development (USAID) Accelerated Microenterprise Advancement Project (AMAP). http://www.microlinks.org/ ev_en.php?ID=21629_201&ID2=DO_TOPIC.

Chalmers, G. 2006. The Value Chain Concept; The Virtuous Circle of Financing; and Dialogue with donors and international organizations (USAID). Papers/presentations included in a summary of the conference Agricultural Value Chain Finance in Costa Rica, 16–18 May 2006.

Christensen, J. L., S. Jackson, A. Riding, and S. Mensah. 1999. Chapter 2 *in Loan Guarantee Schemes in Six Countries*. Aalborg: Aalborg University.

Coulter, J., and G. Onumah. 2002. Role of Warehouse Receipt Systems in Enhanced Commodity Marketing and Rural Livelihoods in Africa, *Food Policy* 27:319–337.

Drechsler, D., and J. Jutting. 2005. Private health insurance for the poor in developing countries. *Policy Insights*, No. 11, August. http://www.oecd.org/dev/insights.

FAO. 2009. Rural Finance: Value Chain Finance.

FAO and Academia de Centroamérica (Costa Rica). 2007. Agricultural Value Chain Finance: Journey of Life on Earth. Summary of the conference Agricultural Value Chain Finance, Costa Rica, 16–18 May 2006.

Fries, R., and B. Akin. 2004. Value Chains and their Significance for Addressing the Rural Finance Challenge, MicroREPORT no. 20, Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance (ACDI/VOCA), funded by the United States Agency for International Development (USAID) Accelerated Microenterprise Advancement Project (AMAP). http://www.microlinks.org/ev_en.php?ID=7098_201&ID2=DO_TOPIC.

Gloy, B. 2005. A Guide to Understanding the Value Chain, reprinted from the September 2005 issue of *Smart Marketing*.

Gonzalez-Vega, C. 2006. Modern Value Chains: Towards the Creation and Strengthening of Creditworthiness. Papers/presentations included in Agricultural Value Chain Finance, a summary of the conference Agricultural Value Chain Finance in Costa Rica, 16–18 May 2006.

Gonzalez-Vega, C., G. Chalmers, R. Quiros, and J. Rodriguez-Meza. 2006. Hortifruti in Central America: A Case Study about the Influence of Supermarkets on the Development and Evolution of Creditworthiness and Small and Medium Agricultural Producers. MicroREPORT No. 57, April. Washington, DC: USAID, AMAP. www.microlinks.org.

Hess, U., and P. Hazell. 2009. Sustainability and scalability of index-based insurance for agriculture and rural livelihoods. Brief No. 5, December. Washington, DC: International Food Policy Research Institute. http://www.ifpri.org/sites/default/files/publications/focus17_05.pdf.

Humphrey, J., and O. Memedovic. 2006. Global Value Chains in the Agrifood Sector. Working Paper, United Nations Industrial Development Organization (UNIDO). http://www.value-chains.org/dyn/bds/docs/621/IDS%20UNIDO%20Global%20VC%20in%20the%20Agrifood%20Sector%2006.pdf.

International Fund for Agricultural Development. 2008. Kenya Launches Revolutionary US$50 Million Farm Programme to Provide Small-Scale Farmers and Farm Businesses Financing and Credit.

International Labour Organization (ILO). 2009. The landscape of microinsurance in Africa. ILO Briefing Note No. 1, October. Geneva: ILO.

Kropp, E. W., and B. Suran. 2002. Linking banks and (financial) self-help groups in India: An assessment. Paper presented at the seminar on SHG-Bank Linking Programme, 25–26 November, New Delhi.

Ledyard, J. O. 2008. Incentive compatibility. In *The New Palgrave Dictionary of Economics, Second Edition*, ed. S. N. Durlauf and Lawrence E. Blume. New York: Palgrave Macmillan. http://www.dictionaryofeconomics.com/article?id=pde2008_I000027.

Llanto, G. M. 2007. Policy and regulatory issues and challenges in microinsurance: The Philippine case. *Journal of Philippine Development* 34 (1): 61–86.

Mangabat, M. 2006. Training Manual on Credit in the Supply and Value Chain of Selected Agricultural Commodities. A study done for the Agricultural Credit Policy Council (ACPC).

Meyer, R. 2007. Analyzing and Financing Value Chains: Cutting Edge Developments in Value Chain Analysis. Paper presented at the 3rd African Microfinance Conference in Kampala, Uganda in August 2007.

Organisation for Economic Co-operation and Development and Food and Agriculture Organization (OECD-FAO). 2009. *OECD-FAO Agricultural Outlook 2009*, 28 July.

Onumah, G. 2003. Improving access to rural finance through regulated warehouse receipt system in Africa. Paper presented in the conference Paving the Way Forward for Rural Finance: An International Conference on Best Practices International Trade Center, Ronald Reagan Building, Washington, DC, 2–4 June 2003.

Quiros, R. 2006. Agricultural Value Chain Finance. A summary of the conference Agricultural Value Chain Finance in Costa Rica, 16–18 May 2006.

RAFI. 2005. Rural and Agricultural Finance Initiative Notes. Issue no. 2, June. [RAFI is a joint effort of USAID's Office of Agriculture and Microenterprise Development Office and the RAFI Team (Chemonics, ACDI/VOCA, Ohio State University and DAI)].

Shepherd, A. W. 2007. Approaches to Linking Producers to Markets. AGSF Occasional Papers, No. 13.

Shwedel, K. 2006. Value Chain Financing: A Strategy for an Orderly, Competitive, Integrated Market. Papers/presentations included in Agricultural Value Chain Finance, a summary of the conference Agricultural Value Chain Finance in Costa Rica, 16–18 May 2006.

Value chain framework: Strengthening value chains to promote economic opportunities. http://www.acdivoca.org/852571DC00681414/ID/ourwork_valuechainsframework.

Value Chain Group, www.value-chain.org.

World Bank. 2005. Rural finance innovations: Topics and case studies. Report No. 32736-GLB, April. Washington, DC.

_____. 2007. Investment climate. www.wbginvestmentclimate.org.

World Economic Forum. 2009. The next billions: Business strategies to enhance food value chain and empower the poor. Geneva.

Chapter 9

Investments in connectivity

Vast opportunities for improving food security result from making the connections between and among links and players in the food supply chain more effective and efficient. The private sector plays a vital role in this set-up. This 3-part chapter looks at solutions available from smallholders and the corporate sector as well as efforts at correlating food and nutrition security. The featured cases are drawn from the 2-part session on connectivity in the Investment Forum. They highlight the importance of access to credit, institutional arrangements that effectively link primary producers to markets, and participatory quality control measures for export-competitive food products.

Solutions from smallholders

Smallholders are generally defined as farmers with a low asset base, operating less than 2 hectares of cropland . About 87% of the world's 500 million smallholder farms are in the Asia and Pacific region. They form the backbone of rural employment and food production. Session 6A, organized by the Asian Development Bank in the Investment Forum for Food Security, highlighted three case studies of smallholder farmers engaged in livestock, vegetable, and fruit production who were able to scale up operations and enter high-value niche markets through collective action and a mix of innovations.

How livestock smallholders help out

Upgrading food security in the Greater Mekong Subregion

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The experiences of smallholder pig and poultry farmers in remote districts in Thailand and Viet Nam offer a sustainable model for rural livelihood generation and broader veterinary public health benefits.

During the last decade, small-scale livestock producers in the Greater Mekong Subregion (GMS) have been losing market share as powerful large-scale operators vie for new markets.[1] In Thailand, large-scale agribusiness interests dominate livestock production, particularly in the urban centers. In Viet Nam, where supermarkets are opening with increasing frequency, the current government policy environment supports scaling up and industrializing production, which is intended to increase national production, control disease risk, and allow greater access to export markets. In this current environment, however, small-scale producers are losing out.

This paper argues that despite the inevitable increase of large-scale agribusiness in the GMS, livestock smallholders can continue to play an important role in supplying animal-derived food to both rural and urban consumers. Availability of locally based providers of inputs (small businesses selling adequate animal breeds, animal feed, and veterinary products) and services (microfinance providers, field research activities, performance monitoring, and on-the-job coaching) are essential for livestock smallholders to compete with large-scale operators in supplying animal-derived food to consumers.

The paper first presents a case study on small-scale pig production in Thailand and Viet Nam, for supplying pork to rural consumers. For smallholders to supply animal-derived food to urban consumers, additional steps are necessary to scale up operations, including better organization of farmers and their production systems, investment in small-scale slaughtering and processing facilities, stricter control of food safety practices, and engagement in product marketing.

The paper then presents a case study on small-scale poultry production, slaughtering, and marketing of meat to urban consumers in Thailand and Viet Nam. Targeting urban consumers (who have access to cheap industrial animal-derived products) requires improved production systems (to decrease production costs) and engagement in slaughtering and processing, which increase the producers' responsibility for food safety.

Both case studies are based on ongoing private partnerships begun in 2009 in Thailand and Viet Nam between a service provider—the Asian Veterinary and Livestock Services (ASVELIS)—and livestock smallholders who operate individually or are grouped in farmer organizations. Initial financial support was provided by foreign agencies.

Headquartered in Viet Nam, ASVELIS is a private group providing a range of services related to the livestock sector. ASVELIS seeks to sustainably establish and develop smallholder-owned and operated livestock supply chains and,

[1] This paper, which was submitted on 19 January 2011, is the developed version of the slide presentation titled "Contribution from Livestock Smallholders in the Upgrade of Food Security and Food Safety in Southeast Asia (Viet Nam)" that was presented by ASVELIS director Patrick Gautier at the Investment Forum for Food Security in Asia and the Pacific on 8 July 2010.—Ed.

in particular, to develop production systems and processing that enable these producers to enter higher value niche markets while addressing veterinary public health issues. ASVELIS supports small- and medium-scale producers in establishing and developing independent, profitable businesses throughout the length of their market value chain. With a strong initial focus on Viet Nam, ASVELIS has since expanded into Thailand and Western Africa. Its multidisciplinary team includes experts on animal health, veterinary public health, livestock value chains (from the farmer to the consumer), and project management.

Pig production by smallholders for rural consumers

Issues and challenges

The major constraint to current smallholder pig producers in remote areas of Thailand and Viet Nam is access to inputs (e.g., piglets for fattening, and gilt [young female pigs] and boars or boar semen for breeding) and basic animal health and animal husbandry services.

In both Sangkhlaburi District (Kanchanaburi Province, Thailand) and Dinh Hoa District (Thai Nguyen Province, Viet Nam), there was a large gap between the number of piglets born locally, due to insufficient numbers of local sows, and local pig fattening and consumption of pork products. In Dinh Hoa, farmers had to rely on "imported" piglets from lowland areas of Northern Viet Nam to fatten (raising weaned pigs to slaughter weight for meat production). The fattened pigs were then sold locally for slaughter and local consumption or to traders for "export" to urban consumers in Ha Noi or southern areas of the People's Republic of China. In Sangkhlaburi, the import of piglets from central Thailand for fattening was not competitive with pork cuts available at local retail markets that originated in intensive farms and the slaughterhouses of central Thailand.

In both areas, producing and fattening piglets of western-type genetic stock was not advisable, as they were not competitive with intensive farms in lowland areas. Therefore, local farmers producing pork were advised to use the following production model: smallholder-based operations; piglets born from a local sow and a western boar; fatteners fed with protein concentrate and locally available raw ingredients (maize, rice bran, cassava, etc.); and supply of meat with a higher fat-to-lean ratio and sold at lower prices than the pork from intensive farms.

In both areas, access to sows of local genotype, and (to a lesser extent) to semen from boars of western genotype, appeared to be the first challenge to overcome.

Innovations and good practices

In Viet Nam, an initial group of 20 households was provided, by loan, with a carefully selected, vaccinated, and dewormed Mong Cai gilt, basic training in gilt and sow management, and support to access animal health services and quality boar semen. The trial proved a success, with all households repaying their loans in less than 12 months and enjoying high profits per litter. In addition to these direct

beneficiaries, local fattener farmers had access to better adapted, healthier weaned piglets from accountable local producers.

In 2007, a rapid rural appraisal conducted by ASVELIS estimated that traders from the lowlands imported to Dinh Hoa 20,000 cross-bred piglets per year. Traders collected piglets from farms, transported them for long periods in cramped conditions, and had limited accountability to their customers as they were not locally based. Dinh Hoa farmers suffered high mortality and low productivity among their fatteners, which was attributable to disease prevalence, stress, and inappropriate genetics.

It was therefore decided that the "imported" piglets could be replaced by scaling up the initial experience to up to 1,000 sows, each farmer raising 1–2 sows and producing 20–40 piglets per year. To begin supporting new smallholders, a project was set up in 2009 in collaboration with BRESIAL, a nongovernment organization that raises funds to help small-scale farmers access credit, livestock, technical advice, and markets. Fifty new smallholders began raising sows in 2010.

As the current suppliers of Mong Cai gilts are far from Dinh Hoa and do not guarantee optimal quality, ASVELIS plans to set up a pig breeding farm that will initially consist of 20 sows and 2 boars to produce up to 200 Mong Cai gilts a year. Providing 1,000 gilts to smallholders during the first 5 years will end the current need for piglets from outside the district. After 5 years, the breeding farm will enable smallholders to replace their spent sows. This new pig breeding farm will also assume responsibility for supplying sow owners with high-quality semen from western-type boars.

In Thailand, no pig breeding farms supplying Asian-type gilts could be identified, so ASVELIS invested directly in a farm to produce gilts. The initial parent stock consists of 20 sows (of Meishan and local breeds) and 2 Meishan boars. The first Asian gilts became available in mid-2010, and were sold to smallholders without difficulty. The Asian male piglets produced (the brothers of the gilts) were sold to smallholders as low-input fatteners. This pig breeding farm is now operating in a sustainable manner. The farm covers all fixed and variable costs associated with current operations, including depreciation on the original investments and staff costs. Profits are expected to increase steadily in the coming year. The piglets sold by the farm are much cheaper than those brought in from central Thailand, require lower cost diets, and are resilient to diseases common to the area.

Beyond the supply of genetics, the pig farm provides an excellent model for other farmers in the area. The staff in the breeding center provides extension services to local farmers. Developing local pig production benefits the breeding center and a private local supplier that is being formed, but, more so, the community at large. All pigs are vaccinated prior to sale and the staff follows up with producers to ensure vaccination programs are maintained and any health problems are addressed in a timely fashion. Farmers are advised on the design and construction of shelters for their animals and on basic management, including biosecurity measures. Farmers are also encouraged to record simple technical and economic data to identify

problems early and develop their concept of pigs as an income source, as opposed to a form of savings. Technicians promote efficient fertility management among farmers and timely off-take to improve incomes.

Gilts are sold, by loan, at 10–12 weeks old whereas male fatteners are sold at 6 weeks. The price of gilts includes the cost of follow-up by the ASVELIS technicians. Once the gilt reaches maturity, the technicians provide an artificial insemination service, at cost to the producer, using high-quality boar semen obtained from Kasetsart University. Over 5 years, piglet producers can expect approximately 10 litters from their sow, producing an average of 100 crossbred piglets, which are sold and/or fattened by the farmer. Current profits average approximately $200 per litter (i.e., every six months) if the piglets are sold—a substantial sum in Sangkhlaburi. Thus, the local community benefits through access to better quality, locally reared piglets.

Chicken production by smallholders for urban consumers

Issues and challenges

In Southeast Asia and many developing countries outside the region, the market share of chicken meat from intensive farms, using highly improved genetics and farm and slaughtering management systems, has increased steadily, particularly in urban areas. The increase, however, has been at the expense of traditional local chickens farmed in backyard systems. In Viet Nam, intensive chicken farming systems still constitute only a small percentage of national production, but this is likely to change rapidly over the coming years. The opening of the Vietnamese economy to imports from countries inside and outside the region further threatens local producers. Smallholders have difficulty competing with the price of industrially produced products in urban markets. Further, some rural GMS districts are beginning to "import" industrially produced chicken meat, and rural sales of industrial broiler meat are increasing because its price is lower than that of local chicken meat.

In addition, food safety is becoming an increasing concern. Neither intensive nor nonintensive farming and slaughtering systems are adequately addressing the food safety hazards related to the consumption of chicken meat, in particular chemical residues and microbial contamination through poor slaughtering hygiene and cold chain management.

But demand for chicken meat that combines taste, affordability, and safety remains high. Smallholders using slow-growth breeds, in particular those derived from "local" genetics, are providing the desired quality. However, low productivity and dependence on traders, slaughterers, and retailers increase the costs and prevent their products from meeting the necessary safety standards.

There is much opportunity for smallholder farmer organizations to engage in professional farming, slaughtering, and marketing of chicken meat, as has been successfully demonstrated in developed countries.

Innovations and good practices

In Viet Nam, in 2009, six farmer-owned organizations (each initially comprising an average of 10 smallholders) entered into partnership with ASVELIS. Together, they implemented animal production food safety principles in free-range chicken farming, built their own small-scale slaughterhouse, and began selling chicken carcasses directly to customers, whereas previously, poultry was sold live at the farm to traders. Selling prices are calculated on the basis of production costs, supplier margins, and the additional cost for stricter veterinary supervision. The supply chains now prioritize reducing disease risk (such as highly pathogenic avian influenza), antibiotic residues, and microbial contamination of carcasses.

By the end of 2010 , three farmer organizations were still operating. They have been assessed and found compliant with the World Organisation for Animal Health (OIE) standards on animal production food safety. The building and equipping of supply chain slaughtering facilities (at a cost of approximately €10,000 or $14,000[2] per supply chain) were completed in March 2010. The volume of carcasses sold had since steadily increased to 600 kilograms per slaughterhouse per month as of November 2010 (about 400 chickens). All farms have remained free of highly pathogenic avian influenza; mortality rates have decreased; and the meat, analyzed for antibiotic residues and microbial contamination, has had acceptable results well within international standards.

On the basis of these results, the quality assurance label "Naturally Viet Nam" is being developed as a certification and an education and marketing tool to support small- and medium-scale poultry producers and enhance consumer understanding of food safety issues. This certification may also expand to other food products in the future. Poultry products certified as Naturally Viet Nam adhere to strict standards of good animal husbandry practices and good slaughtering practices, and are transported through guaranteed unbroken cold chains. Standards developed are derived from international standards adapted to the Vietnamese context.

Supply chains are short. Although producer groups vary in their makeup , all are within one link of the retailer, which offers two key advantages. First, products can be effectively traced from input suppliers to consumers, thereby improving monitoring of food safety issues and ensuring the maintenance of high standards. This provides a powerful marketing tool for consumers, both in terms of product quality and connection to the producer, allowing for a price premium. Second, the short supply chain ensures that products can be produced competitively despite the scale of production.

ASVELIS provides technical support to farmer groups, quality control inspections, and marketing support. Producers cover costs of quality control and technical support at this stage while marketing is supported with funding from the United States Agency for International Development (USAID). Dissemination of flyers, organization of seminars, production of DVDs, the flagship website, and ad

[2] At the exchange rate of $1.4/€1.0 in March 2010.

hoc activities provide information on products and production methods, standards, the certification process, and deliver up-to-date reports on issues pertaining to food safety such as antibiotic residues in poultry products.

Currently, Naturally Viet Nam's customers range from high-end hotels and restaurants to individual households. The Naturally Viet Nam label operates a small, walk-in shop in Ha Noi and supplies poultry products wholesale to hotels and restaurants.

Profits per kilogram of carcass are substantially higher for the producers than selling live birds, thus suppliers are willing to cover the additional costs of certification. By the end of 2011, all current supply chains are expected to be operating profitably as private businesses in continued partnership with ASVELIS.

In Thailand, ASVELIS and 20 smallholders have engaged in a similar value-chain development model. With the current domination of the Thai poultry market by industrially produced broiler chickens, the demand for locally reared, slow-growth chicken meat is high. Despite the relatively large distance between Sangkhlaburi and Bangkok (the urban market currently targeted), the politically volatile nature of the district, and its status as one of the poorer districts in Thailand, producers now sell poultry products regularly to five-star hotels and a high-end butcher in the capital. Developing stable markets such as this offers a sustainable method for small-scale producers in remote areas of Thailand to generate income and to provide health benefits to consumers.

Action areas

The lessons learned from smallholder activities with both pigs and poultry in Thailand and Viet Nam provide ample scope for upscaling current supply chains and replicating them using private investment and, where practical, local government support in setting up new supply chains. Replication in other countries is both feasible and necessary to strengthen smallholder systems as they face rising challenges from other agriculture sector actors, both domestic and international. Both the pig and poultry models are feasible in a wide range of environments throughout the GMS, particularly remote areas, which often constitute the least food-secure places. Public and private sectors in Cambodia, the Lao People's Democratic Republic, Myanmar, and the southern People's Republic of China have expressed interest in setting up such supply chains. Continuing communications are likely to lead to the establishment of similar models beyond the current operations.

For a remote district with a piglet deficit of 20,000 or with a pork deficit of approximately 1,000 tons, setting up a small pig breeding farm supplying appropriate gilts can enable up to 1,000 small-scale piglet producers and up to 5,000 fattener farmers to significantly improve their livelihoods sustainably. The number of GMS districts similar to Sangkhlaburi and Dinh Hoa is unknown but undoubtedly is high; examples of appropriate locations for replication in rural

Cambodia, the Lao People's Democratic Republic, Myanmar, Northern Thailand, and Northern and Central Viet Nam have been noted. The extension and/or replication of the experience could benefit significant numbers of rural poor in the GMS and further afield.

Continuing to develop current markets and determining best practices for market development will remain a focus. The maintenance of standards and growth of the Naturally Viet Nam label as a recognized sign of quality can benefit small-scale producers in the long term. Developing standards for other livestock systems and expanding the label to include these products, with due diligence and continued monitoring and advocacy, provide further areas for enhancement.

In Viet Nam, a free-range poultry association is currently being developed as a source of information for both consumers and suppliers, and as an interest group able to communicate smallholder interests and initiate policy dialogue at national and subnational levels. People in Viet Nam's government have shown support for the Naturally Viet Nam concept. Continuing to champion improved product quality and safety while advocating the role of smallholders in national agricultural development can influence future policy makers and policy making and thus benefit many people.

Conclusions

Developing innovative, sustainable approaches to improving the competitiveness of small-scale livestock production can have a major impact on rural livelihood generation and food security among low-income and poor households. Further, benefits in terms of food safety and disease control can be addressed by developing smallholder supply chains.

Though the prevailing belief has been that intensive, large-scale systems offer greater biosecurity and produce safer products, a strong pool of evidence now contradicts this paradigm. Small-scale, low-tech producers can be as safe, if not safer, than high-tech industrial systems from both disease risk reduction and consumer food safety perspectives. Furthermore, improved practices can open higher value markets, such as hotels, restaurants, and caterers, as well as individual households, as they appreciate the dangers of antimicrobial and growth hormone residues and microbial contamination. Developing consumer awareness of veterinary public health risks not only benefits small-scale producers adhering to these principles, but increases pressure on governments and agribusiness operators, such as feed suppliers, to address these concerns through relevant policies and safer products.

The combination of adequate risk-based farm biosecurity, strict veterinary supervision of on-farm medication, small well-designed slaughterhouses, and good marketing activities are cost effective and sustainable activities and can contribute effectively to improving food security through livestock and complying with international food safety standards.

Food security and food safety are intimately linked. To enable smallholders to comply with international safety standards for the production food from animals, the needed improvements to their organization, infrastructure, and capacity must be put in place. Smallholder livestock farming can be successfully developed to increase food security if farmers are able to access markets that are sustainable and if their efforts to comply with food safety standards are sufficiently rewarded.

Increasing the market chain participation of small producers

The NorminVeggies case

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Northern Mindanao Vegetable Producers Association, Inc.

Small-scale vegetable producers in Northern Mindanao organized themselves into an association and integrated their activities to build market supply chains, enabling them to expand into more lucrative markets.

Vegetables have primarily been grown by small-scale producers and traditionally marketed to traders on a spot market arrangement. Very few small-scale producers are able to supply directly to modern markets such as supermarkets or their consolidators. Wet markets still dominate about 80% of the retail market in the Philippines because they offer more variety at lower prices than supermarkets. The vegetable industry, however, is rapidly restructuring, brought about by the proliferation of fast-food chains, supermarkets, food processors, consolidators, hotels, and restaurants.

Modern markets need high-quality products in large quantities supplied reliably throughout the year. They operate in a highly competitive business environment that drives them to focus on efficiency and costs, and thus prefer suppliers that are able to organize and integrate their activities. The procurement requirements and practices of these modern markets in turn have significantly changed the way farm production, product supply, and commercial market transactions are done.

Entry into modern markets requires a major shift in the practices of small producers. They need to coordinate activities among themselves as producers, and with business service providers and other stakeholders, to ensure that fresh produce is consolidated and efficiently brought from the farms to the markets.

In the southern Philippines, small-scale vegetable producers organized themselves into the Northern Mindanao Vegetable Producers Association, or NorminVeggies, to step up their participation in the dual vegetable market system of the traditional and modern market supply chains.

Challenges and opportunities in marketing

NorminVeggies is a nonstock, nonprofit organization set up by 15 producers in 1999. It has grown to 177 members who share common concerns and a common stake in developing the vegetable industry. Its membership is diverse:

- independent growers, or small-scale producers, who have a financial base and can independently access technologies and markets;
- small-scale farmers who need special development interventions to undertake vegetable production and marketing;
- development foundations and nongovernment organizations (NGO) assisting small-scale farmers;
- corporate farms that can vertically integrate business operations;
- input and service providers such as the seed companies; and
- local government units (LGUs), particularly their agriculture departments, which directly serve vegetable farmers.

The membership consists primarily of independent growers and small-scale farmers, supported by development foundations and NGOs.

Before NorminVeggies embarked on group marketing in 2005, independent growers and small-scale farmers belonging to the association individually marketed their vegetables in the traditional wet market in Agora, Cagayan de Oro, the main wholesaling trading center in Northern Mindanao. The corporate farms did not engage in group marketing because they were big enough to establish their own integrated set-up from production to marketing.

The prevailing practice of small-scale producers was to harvest even without a ready buyer, and they endured the uncertainty of fluctuating prices based on the supply and demand for the day at the wet market. They had no voice in vegetable handling and storage conditions. Even if NorminVeggies' produce were of good quality, poor handling at the Agora market adversely translated into losses as high as 50% of the produce. In turn, traders imposed high deductions on weight or price to absorb losses. However, they were not open to producers' suggestions for improved handling, as the traders themselves sorted and graded the produce before selling it to supermarkets and fast-food chains through their consolidators.

Small-scale producers had a very limited window to introduce better postharvest practices. They were compelled to accept the arbitrary deductions on price and weight that drastically reduced their incomes. They were subjected to uncertainty and risk in the volatile spot market where growers were just price takers.

NorminVeggies saw that the only option for the independent growers and small-scale farmers was to undertake their own collective marketing program. They sought to continue participating in the traditional market chain, but with improved vegetable postharvest handling, while moving into forward integration activities to tap into the high value, more stable modern market chains.

With support from its main development partners, the Department of Agriculture, and the Growth with Equity in Mindanao (GEM) program of the United States Agency for International Development (USAID), NorminVeggies set

up in mid-2005 a consolidation center strategically located in the Agora wholesale trading center. This facility became crucial in building its identity as a significant market player. It enabled NorminVeggies to respond to the opportunities of an expanded market covering neighboring provinces in Mindanao, the Visayan islands, and Manila, and to become especially competitive during the rainy months.

NorminVeggies supplies weekly product commitments to fast-food chains, supermarkets, hotels, and restaurants, either directly or through their consolidators. After sorting, off-size products and the buffer supplies are sold in the traditional market. At present, NorminVeggies consolidates a daily volume of 5–10 metric tons. Its consolidation facility and postharvest and marketing services have been opened to small-scale farmers through its NGO members. The NGOs have partnered with Catholic Relief Services (CRS) to carry out appropriate development interventions that prepare small-scale farmers to actively participate in the market chains.

A mix of innovations

NorminVeggies exemplifies an organization of small-scale producers that has successfully overcome the barriers to modern markets while actively engaging in the traditional market of traders in the existing dualistic vegetable supply chain. A mix of innovations enabled it to succeed.

Producer organizing: The formation of clusters

The problem of trading in modern markets is often said to be a problem of reliable product supply. To address this, NorminVeggies formed clusters of vegetable producers interested in joining group marketing. A cluster is an informal group of 5–15 members who commit to a common marketing plan for a particular product or set of products for identified markets. In the cluster, growers talk about the market and the value addition in the supply chain, and decide as a group on the buyers that will be served.

The cluster is product-based and acts as a product supply unit. All the cluster members follow a quality assurance plan for each product and a program of production based on marketing goals. In addition, cluster members share know-how and best farm practices. The clusters always produce 50% more than they will commit to contracted markets. Thus, a surplus is always expected in the production of each cluster member, and it goes into the traditional market after the product sorting and grading process is done. Each member therefore has a capacity to supplement a deficiency of other members.

The clustering strategy allows producers to become valued suppliers. Under this strategy, products are traceable to the farm and to the grower. A supply and delivery forecast can be made. Quality considerations are discussed with the buyers, and advance information can be provided to them in case supplies fluctuate due to climatic factors. This system of organizing has proved very attractive to agrifood companies because the cluster provides the mechanisms for quality control, quick

response to buyer feedback, and implementation of market-related innovations as needed. This assures the market that the constraints of procuring from dispersed small-scale producers are addressed.

Collaboration of clusters of independent growers and small-scale farmers

NorminVeggies has two kinds of clusters: independent growers and small-scale farmers. Independent growers are financially independent and have other sources of income. They have more access to capital and technologies, have higher educational attainment, and are more capable of taking risks in trying out new practices than are small-scale farmers. They have thus been the drivers in technology improvements and test marketing activities.

On the other hand, small-scale farmers have farms that are family operated. They need assistance to access technology, financing, and markets. Currently, this set of needs is provided through development programs of NGOs, LGUs, and financing institutions. Given their number and geographical spread, they can deliver the product volumes needed.

Products from the combination of two types of clusters provide a supply base to consolidate product volumes and variety. This increases access to diversified and predictable markets. For example, to supply a supermarket (Gaisano) twice a week, products from independent grower clusters (e.g., bell peppers, lettuces, broccoli) are mixed with those from the small-scale farmer clusters (e.g., bitter gourd, squash, eggplant, etc.), complementing the supply.

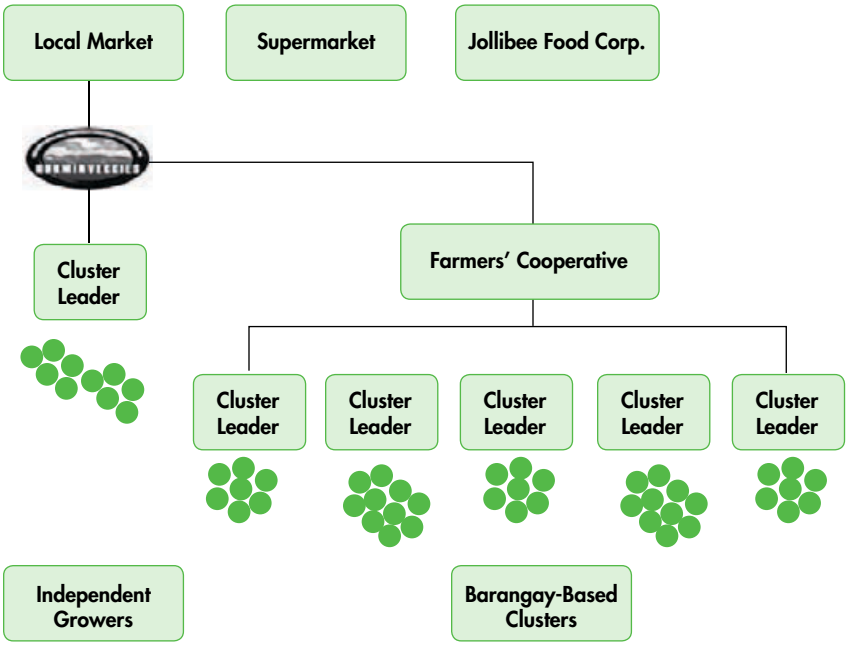
Some products, however, are consolidated immediately by the clusters of both the independent and small-scale farmers. An example is the consolidation of bulb onions and vegetables for the fast-food giant, Jollibee Food Corporation (Figure 1), which is provided by 1 cluster of 5 independent growers and 8 clusters of small-scale farmers (altogether 90 farmers).

The organization of NorminVeggies as a specialized intermediary: Business orientation with development motivation

The success of NorminVeggies' marketing program rests on its capacity to undertake supply chain management that primarily involves handling well the collaboration among its producers and its own coordination with the buyers, service providers, and other market actors to ensure efficient product flow from the farms to the buyers. GEM–USAID provided strategic support for the value chain development that expanded the market horizon of NorminVeggies producers, as part of the bigger GEM program to contribute to industry development.

GEM–USAID's key enabling support for NorminVeggies took eight forms: (1) organizational strengthening of NorminVeggies as a business service entity, (2) technology development in production and postharvest improvements, (3) establishment of the consolidation center, (4) logistical support in the testing to penetrate the modern markets, (5) formulation of product quality assurance

Figure 1: Collaboration of independent grower and small-scale farmer clusters for bulb onion and vegetable supply to Jollibee Food Corporation

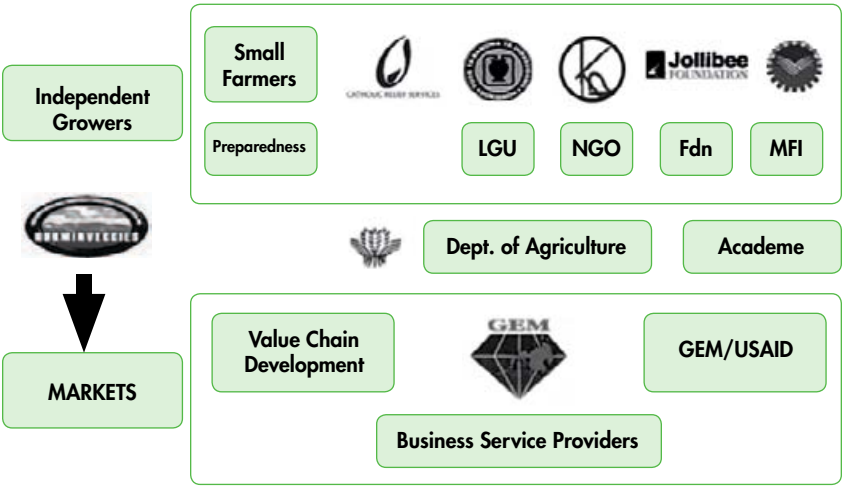


protocols, (6) installation of business operating systems, (7) holding of vegetable congresses for policy and program advocacy to advance the industry, and (8) market promotion through participation in trade fairs and support for market encounter meetings.

These support mechanisms were provided in partnership with the Department of Agriculture and with counterpart support from NorminVeggies' members. Thus, given the resources needed, independent growers with an adequate financial base can be the drivers in value-chain development.

One key innovation is the organizational character of NorminVeggies (Figure 2). It has evolved into an organization that is not just a market facilitator with a business orientation, it has assumed support for small-scale farmers as part of its responsibility. This development motivation stems from the independent growers' appreciation that much of the assistance the association garnered from the government and GEM–USAID is not just for themselves, but also for the small-scale farmers. Thus, NorminVeggies established alliances with NGOs and the LGUs supporting small-scale farmers.

Figure 2: NorminVeggies as specialized intermediary



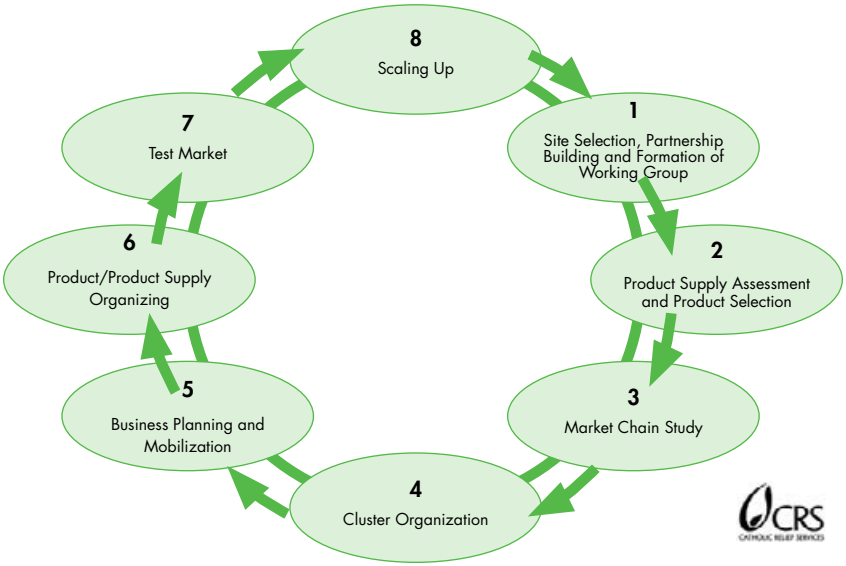
Appropriate development support for small-scale farmers

From the start, NorminVeggies wanted small-scale farmers to be part of the marketing clusters and took steps to bring them in. But the small-scale farmers often had problems delivering crops of reliable quality. The limitations of small-scale farmers are difficult for the independent growers to address alone. The support of development agencies and the government was needed to address the constraints and enable the small-scale farmers to be good performers in the clusters.

In 2005, CRS studied the NorminVeggies experience on clustering. The lessons on forming growers into marketing clusters and the value chain development were valuable, but CRS saw the importance of also undertaking the most basic work—adequately preparing small-scale farmers to engage the market. This is not easy given the tremendous challenges facing farmers: poor productivity, infrastructure gaps, poor logistical capabilities, a lack of understanding of how markets work, lack of credit, and fragmented locations and farming activities. All these problems curtailed farmers' active participation in the market chains and the clustering method.

CRS, with its NGO and LGU partners and the support of the United States Department of Agriculture, achieved a promising process with preparing farmers for market engagement while implementing the Small Farmers Marketing Project. The approach, called "the clustering strategy for the agroenterprise development of small farmers," involves a sequential process of eight steps that prepares farmers to link with the market, assists them to be effectively organized into small groups or clusters, and guides them to engage the market (Figure 3). The first six steps comprise the preparatory activities to ensure a higher degree of success when actual marketing starts in step 7 (test marketing) and step 8 (scaling up).

Figure 3: The clustering approach to agroenterprise development for small-scale farmers



The clustering strategy was applied by Jollibee Foundation in its Bridging Farmers to Jollibee Supply Chain Project. Launched in May 2008, Jollibee Foundation carries out the project in partnership with CRS and the National Livelihood Development Corporation, a government financing agency that extends services through microfinance institutions and focuses on the needs of agrarian reform communities.

Business organizing: Forward integration and market facilitation

Servicing the buyers requires a high level of assurance in delivering product volume and quality based on schedules. NorminVeggies coordinated with the producers on the needed interrelated activities, such as production scheduling, postharvest requirements, logistics (land transport, seaport, and airport operations), grower and buyer communication, invoicing, payment collection, and sale remittances. It organized a management team to handle these responsibilities, the costs of which were defrayed by the market facilitation fees charged to the producers for forward integration services.

A key innovation is that NorminVeggies is not a trading entity. Rather, it is a market facilitator that links the producers (through the cluster) directly to the buyers. The producers are given the buyers' price and are thereby made accountable for the product and retain ownership of the product until it is bought. This encourages the producers to supply the best quality when the price is given to them, and all sales proceeds are remitted directly to them after deducting the market facilitation fee based on accepted vegetables. Conversely, all rejects are charged to the individual grower. Labeling the products by farm or producer provides traceability and a

system to sanction noncompliance. Transparency in the sale transactions due to the facilitation fee system builds trust among the producers.

Investment in production efficiency and value addition

Matched with the quality assurance plan is a guide to the producers on what needs to be done with the corresponding investments to institute recommended improvements in production, postharvest, and value addition practices. The support of government and resource organizations has enabled the producers to invest in indigenous rain shelters,[3] drip irrigation systems, adaptability trials for various seeds and technologies, packaging and warehousing, and cold chain services that are critical to attain better efficiencies and higher competitiveness in the market.

For example, an interest-free, 5-year loan from the Department of Agriculture has enabled NorminVeggies to work on cold chain development by acquiring a reefer truck. It also had support from both the Department of Agriculture and GEM–USAID to furnish its consolidation center with basic equipment (digital weighing scale, plastic crates, computers with software, etc.). GEM–USAID support also enabled some producers to travel and observe the results of trials in cold storage shipment.

While the bulk of resources come from the independent growers of NorminVeggies, the assistance fills gaps to enable small-scale producers to respond to market opportunities. The support of the Department of Agriculture, the LGUs, and CRS in building the rain shelters and water catchments of small-scale farmers enabled them to stabilize production, facilitating their inclusion in the modern market. These production improvements would have been too expensive for small-scale farmers to acquire on their own, just as the development of alternative market chains would have been too risky for them to pursue on their own.

Moving forward

The experience of NorminVeggies in organizing producers into clusters for product consolidation, supply chain management, product supply, and networking with various institutions demonstrates significant innovations that successfully increase participation of small-scale producers in the dual system of traditional and modern markets. They highlight that many activities are interrelated and that building linkages with government (national and local), resource organizations, NGOs, businesses, and research organizations is critical in enabling small-scale producers to break into the dynamic modern markets.

Overcoming the most important hurdles is what moves small-scale producers to aspire further and invest in alternative supply chains that give them the concrete opportunities for stable incomes and sustainable vegetable enterprises.

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[3] The shelters are made of bamboo, lumber, and ultraviolet-treated plastic roofing and serve as protective covering of crops.—Ed.

Resolving quality control and market access for small farms

The K-Farm Carambola GAP Program

Kit Chan
Managing Director
K-Farm, Malaysia

Retailer and consumer concerns about pesticide residues and food safety spur a small company to adopt protocols on good agricultural practices to broaden its market for its unique tropical fruit.

The carambola (called *balimbing* in the Philippines) is an indigenous tropical fruit in Malaysia. The local consumption of this fruit has not allowed the carambola to attain the "major tropical fruit" category because the country's domestic market is small. The early producers were mainly backyard farms with limited trees of unspecified varieties. Not until the Carambola variety B10 was discovered and further research done on it by the Malaysia Agriculture Research and Development Institute was the fruit adopted as attractive for consumers. The new variety is less fibrous, is sweeter, has more flavor, and is more aesthetically appealing than its predecessors.

Tropical star: Carambola fruit tree.

The newly adopted fruit, with its unique shape and size, together with its health claims, blended well with the Chinese character of the Hong Kong, China market, and export demand grew dramatically from Hong Kong, China.

Using the same marketing approach, some exporters took the fruit to Europe, emphasizing its unique star shape cross-section. Access to the European Union (EU) market was equally successful, but the traders insisted on smaller and less mature fruit due to logistic constraints.

General situation of carambola farming in Malaysia

Star shape: Ripe cross-section.

The carambola farmers

Carambola farmers in Malaysia are mostly illiterate and elderly, with very limited financial resources. Their knowledge of fruit production is largely based on traditional practices.

For the Hong Kong, China export market, consumers wanted large, juicy fruits. To produce these, the farmers applied a lot of chemical fertilizers. In Europe, the importers projected the carambola as an "exotic perfection from the East," insisting on a blemish-free and factory-perfect fruit. Retaining the fruit's shape and form through careful handling made this requirement a major challenge for the farmers.

To meet the requirement, the farmers resorted to heavier pesticide applications. When pesticide resistance started to emerge, farmers used even more pesticides and more frequent applications as they thought that the previous applications were not sufficiently effective. Their rationale was to destroy the pests and stop disease so the crop would not be destroyed.

Chemical retailers

To the farmers, chemical pesticide symbolizes modern science, and the chemical retailer is the "guru" of this science. Chemical company sales agents, whose livelihood depends on selling pesticides, visit farms regularly, observe farm pest conditions, and provide recommendations for pesticide control.

Government agriculture institutions

Malaysia's agriculture institutions have noble aims for community economic growth and rural community development. They also recognize that many rural farmers have limited or no working capital or seed capital to begin commercial production. Government assistance and subsidies are provided. Large-scale agriculture projects are implemented to achieve rural development and profitability together. Many such projects operate on models of successful large-scale plantation management. But small-scale farmers' capacities and the agronomic conditions of their crop production are not the same as for large-scale producers.

Global market trends

The emergent issues of food safety and environmental conservation in the EU at the start of 2000 put many farmers at risk of losing market share. The issues were not new. Food safety laws and practices on integrated crop and pest management were already guiding farmers. This time, however, the issues drew dramatic attention

because the proponents were the industry retailers and marketers. In the past, anyone found to have flouted the rules was only fined by the authorities, which the culprit could easily afford to pay even while continuing the same practices.

Under the new market conditions, especially in the EU, producers who failed to comply were barred from the trade by the retailers. This was a very effective way of exerting control and producers could not escape by cheating or bending the rules. Shipments of fruits and vegetables arriving in the EU were regularly tested for the maximum pesticide residue level.

Market conditions change constantly and quickly. To be competitive, the marketer must have a strong and trusted network of connections to detect changes early and take remedial action quickly and precisely. The changing global market trends broke up many traditional marketing chains. This allowed for shorter and more direct contacts between producers and consumers. It also provided new opportunities for access to niche markets that appreciate value-added produce and accord favorable pricing mechanisms. This provided an opening for small-scale producers.

Carambola farming practices and marketing conditions

The prevailing carambola production and marketing system does not encourage growth and sustainability of the industry. Farmers are still struggling with pests and diseases that ravage trees and fruits. What is more worrying is that farmers often cannot differentiate between insect damage and fungal disease. The general remedy is to spray the trees with pesticide, and often with a cocktail of pesticides.

The quality of the fruit is based only on aesthetic look and size. The completely clean and large fruit is considered the perfect fruit. The issues of safe farm practices, safe produce, produce hygiene, and pesticide residue levels are not considered urgent requirements.

The EU market for carambola boomed in the early 1990s. The fruit was welcomed as a new exotic tropical item and no trader wanted to be left out of the trade. Many export companies, both small private individuals and public agencies, arose in Malaysia to cash in on this new export product. The formula was simple: contract a farmer to plant the fruit, harvest the fruit, pack it into a corrugated box, and ship it out.

The supply chain was basic and streamlined. Anyone with a truck who knew where a carambola farm was became a collector and, if possible, an exporter. Finding a buyer in the EU was as simple as locating a name in the fruit trade directory. Fruit for export was selected based on what the collectors wanted—clean-looking fruits. Often, only about 30% of the harvest was selectable for export. Fruit that was not selected was left at the farms to be disposed of by the farmer. The price difference between local market quality and export quality was about 1:5 times. When supply was short, the prices became even more attractive, but during a glut, prices came down disproportionately although the same quantity of fruit was selected.

Packing standards and benchmarks did not exist and the basic handling procedures for fruit storage were poor, especially for long-haul sea shipments. Arrival claims by importers for bad quality were frequent and losses were incurred. The losses were passed on to the farmers. Continued losses could force farmers to give up farming.

Farmers tolerated these practices because they had no alternative markets. The EU export market was the only avenue that provided a price incentive to continue to grow their produce, despite the disadvantages. Producers knew only that they had to work hard, and, to succeed, they had to work harder. Thus, the farmers were very vulnerable to negative changes in the environment and the global economy.

Developing the GAP Program for carambola farmers

K-Farm Sdn Bhd developed the Good Agricultural Practices (GAP) Program because the prevailing situation could not sustain the industry. The global market trend had moved toward more competitive global suppliers. The production systems of many carambola farmers were based more on chance than on agriculture science—the farmers hoped that they would have a good crop, the weather would not cause damage, pests would not attack, and the market would not be glutted again. K-Farm realized that the root of the industry problem was the farmers' ignorance of production technology and market requirements because they were isolated from access to production technology and market information.

Meanwhile, the EU set more stringent standards of food safety and hygiene. With the more frequent occurrences of global pandemic viral and bacterial diseases, consumers have become more aware of food-related diseases and are therefore more sensitive and selective in their food consumption. K-Farm needed to provide its EU importers and consumers with assurance and confidence about its produce. Shipping the carambola with a recognized third party quality certification, such as EUREPG.A.P. (now named GLOBALG.A.P.),[1] was a very persuasive and verifiable approach to the food safety and quality issue.

K-Farm started out as a group of farmers that planted a carambola nursery, learned the problems and techniques of fruit cultivation hands-on, watched the trees grow along with the market, and understood the unfair practices of the collectors and exporters when they arrive at farms to buy the first crop harvests.

K-Farm's major difference from the other farmers is that it could read and speak the language of the researchers and marketers—understanding academic research and technical resource materials (textbooks and the internet) and asking the right

[1] GLOBALG.A.P is a private sector body that sets voluntary standards for the certification of agricultural products around the globe. The aim is to establish one standard for Good Agricultural Practice (G.A.P.) with different product applications capable of fitting to the whole of global agriculture. http://www.globalgap.org/cms/front_content.php?idcat=2.—Ed.

questions to the right people and making themselves understood. Over the years, K-Farm's network of contacts among researchers, traders, and government officials has grown globally, turning them into friends, business partners, and associates. This vibrant network of close connections is a fundamental strength of K-Farm.

The GAP Program is a private sector initiative that developed out of the need to change carambola cultivation practices because of changing market requirements and market conditions. The GAP Program's objective is to produce safe fruit for export to Europe, benchmarked on the requirements of EUREPG.A.P. The approach is to connect small-scale individual farmers to the K-Farm carambola supply chain and make them an integral part of the chain so that they can control their production quality, assume pest management and costs, and manage the production volume to support client demand regularly and consistently.

The tools for making this happen started from simple recordings of daily farm activities to eventually building a farmers' production manual for carambola. K-Farm recognizes the importance of the farmers' experiences, which derive from their daily observation of the trees. These experiences have been translated into information resources and instruction in the GAP production programs. The experiences are shared among all the farmers in the group. The GAP Program encourages the farmers to self-regulate their safe practices rather than having restrictions imposed from outside.

Technical farm problems that the group could not solve were brought to the attention of researchers (Malaysian and international institutions) through formal discussions or project developments. The research solutions were returned to the farms and put into practice.

The overriding tool of the GAP Program is still the price. Indeed, as with any program, if the farm gate price of the product is not agreeable to the farmer, no amount of persuasion will work. However, the farm gate price must reflect the farmer's added value. This idea was strongly impressed on the farmers at a very early stage.

As a result of the GAP Program, K-Farm was able to market the GAP carambola at a price about 30% above the competition. Substantial savings were made by introducing more effective pesticide control and fertilizers, using less chemicals and cheaper inputs. When organic substitutes were used, the savings were even greater.

Table 1 briefly describes the approach to developing the K-Farm GAP Program.

Participants in the GAP Program were the farmers contracted by K-Farm. The encouragements and incentives provided to entice participation were a premium price for the GAP carambola produce and an assured market.

Participation meant that the farmers must strictly comply with the K-Farm quality management standards, agree to participate in the training program on carambola cultivation, and commit to adopt the new farm techniques and eventual accreditation to EUREPG.A.P.

Table 1: The K-Farm GAP Program

Program approach	Action
Problem	Noncompliance with the production safety standards of carambola for the European Union market
Scale	Work with contracted smallholder carambola farmers
Solutions	Adoption of EUREPG.A.P. protocols into current farm practices
Objective	Seek EUREPG.A.P. certification for the farms
Immediate action	Ensure that maximum level of pesticide residue in carambola is not breached
Work plan	Develop incentives and contractual commitment for farmers to participate in the program Replace toxic pesticides with lower toxicity or biological pesticides Review fertilizer application programs Introduce integrated pest and crop management, and K-Farm Good Agricultural Practices and quality management standards practices Develop production schedules to match export demands
Technical support	In-house agriculture expert National Research Institution Department of Agriculture Agriculture chemical companies

Developing the training program

First, a technical manager (agriculturalist) was hired to work full time for the program. The manager was trained in the K-Farm GAP quality management system, the protocols of EUREPG.A.P. integrated pest management, and marketing techniques. Second, farmers were surveyed and an information profile made about them. The important information obtained included current farm practices, production costs, and their signed commitment for change. Third, the training program for the carambola farmers was developed following the farmers' historic practices, but with fundamental changes for pest control, harvest, and postharvest handling practices. Other training topics included marketing, crop protection, fertilizer application, harvesting and packaging, and farm environment management. Fourth, the EUREPG.A.P. protocols and integrated pest management principles were used as references and benchmarks. Last, production programs were formulated for each farmer in accordance with the size and age of the trees.

Formal scheduled meetings took place between farmers and the technical manager, where the farmers were taught about pest life cycles, functions of chemical pesticides, ecological balance in the farm, and market situations. Meetings were held in small groups. Occasionally an expert was invited to speak. New ideas were brought up during discussions. These were debated among the farmers and then recommended for trials. The approaches of adult education were fully employed.

All participating farmers must be committed to the GAP Program. If a farmer fails to comply with the program, the effect weighs on the whole group. In this way,

each farmer becomes a custodian of the program. Each farmer signs a contract with K-Farm. The contract defines the GAP Program, the terms of price and payments, and quality specifications. Sanctions are imposed when farmers do not comply with their commitments.

Training methods

To bring the farmers together and keep them informed of major changes in production and market conditions (such as an outbreak of crop diseases, the start of weather changes, higher or lower demand in the market),

- the technical manager makes weekly farm visits,
- workshops are held on the K-Farm premises,
- group visits are made to chemical companies or other farms,
- production plans and practices are recommended, and
- information handouts are given to farmers.

As farmers have little capacity on their own to make official visits or meet with technical experts to seek explanations, K-Farm establishes contacts with the experts and arranges for meetings. Providing the farmers with updated information keeps them well informed of changes in the industry.

The recommended production plans guide the farmers on how much fruit they ought to produce to meet the market demand for that season, and this is reflected in what others in the group are producing. By juggling production between the farmers, K-Farm can manage a regulated quantity to meet the demand throughout the year without excess production wastage.

Results of the K-Farm GAP Program

The GAP Program has made progress since 2003 (Table 2). The training content has been significantly refined and expanded. Some of the assumptions and prejudices of the farmers and the technical manager that existed at the beginning of the program have gone through critical changes. Although farmers are often generally considered to be averse to change, a number of the contracted growers are now star performers in the program.

The trade complex is a catalytic tool that has made the program very effective. Being able to market the crop at the best price in the best market, again and again, farmers saw as a persuasive argument to change bad practices and adopt safer, more cost-effective cultivation methods. Trusting the farmers and leading them to understand how the market functions was a great achievement of the GAP Program. On their own, the farmers would not have been able to achieve EUREPG.A.P. certification or market the certified carambola effectively.

A success story in smallholder tropical fruit production

With hindsight, K-Farm is able to infer a number of reasons for the GAP Program's success. Foremost is the commitment of the managers and the farmers, which is

Table 2: Results of the K-Farm GAP Program

Production	Results	Remarks
Percentage of export quality fruits	Increased by 30% from the start of the project	Price of export quality fruit is 5x that of domestic quality fruit
Production yields	Net increase of 10% from previous production	The increase was achieved by • less pest damage to fruit, • effective fertilizer applications, and • effective flowering and fruit set techniques
Production wastage	No production waste due to no overproduction	The farmers produced just enough for the market and took precautions during glut production periods. The farmers acquired techniques to control production volumes.
Production input cost	Reduced pesticide cost by 30% Reduced fertilizer cost by 30%	Reduced dosage rate and frequency, and introduced alternative use of effective pesticides Farmers used better quality fertilizer grades and only the required amounts Reduced fertilizer leaching through more effective application method
Pest control	Lower incidence of pest and disease damage	Effective use of pest-specific pesticides Reduced resistance to pesticides

the principal element of the program. Other considerations that contributed to the program's success include the following:

- Regular direct contact between the facilitators (the technical manager and K-Farm marketing and research experts) and the farmers established mutual trust. The intentions of all parties are transparent and nonexclusive.
- The GAP Program works with a manageable number of farmers (about 20)—monitoring and evaluation work are more effective with a small group.
- Tools developed under the program that were useful in the monitoring work include the farm tracking and early warning system, shipment forecast programs, and the production manual. Farm problems were anticipated and the recourses were easily applied.
- The technical managers made simple farm recommendations. Results were easily achieved and the farmers were convinced by their own results. An example is applying soap sprays against thrips—a simple, effective, and inexpensive technique.
- It was a "natural partnership" between K-Farm and the farmers. The partnership brought the farmers to the market and EU buyers to the farm. All three parties realized that they needed each other to keep the business growing.

- Technology was transferred in simple forms. These were necessary farm techniques, and the impacts were tremendous. Combining conventional farm practices and organic farming approaches was useful and effective.
- The farmers achieved EUREPG.A.P. certification. They now sell their fruits in the best markets in the EU at premium prices in a sustainable business arrangement.

Sustainability of K-Farm GAP Program

The program is wholly a private sector initiative, particularly in terms of financing.

- Farmers make no additional financial input to participate in the program. They purchase their own farm inputs, but cheaper versions and in lower quantities.
- Farmers need no subsidies or financial assistance to enrol into the program.
- Maintenance of the program is inexpensive; K-Farm hires the technical manager.
- All other incidental costs are borne by K-Farm, e.g., time and effort to develop the program. The returns to K-Farm's program investment come in the form of better quality fruit and more consistent supply for K-Farm to export.
- The private chemical companies and government research agencies participate in the program by providing information and technology services without charge. In return, the farmers make purchases from the chemical companies and provide data to the research agencies.
- Farmers realized financial gains at a very early stage of the program.
- The farmers' commitment to continue working in the program is profit-driven. Profit also drives K-Farm to continue to expand its market scope.
- The farmers' income gains result from the production of better quality fruit that is acceptable to the clients.
- The farmers' higher profits also result from lowered production costs through accurate fertilizer application, less use of pesticides, and more effective pesticide use, and from higher production yields.

The K-Farm GAP Program, despite the absence of external financial support, has proved to be sustainable as shown by the following:

- The program can sustain itself as long as there is trade for the produce. This will push the participants to be more competitive.
- New and distant markets are being opened for the produce because of its high quality and recognition.
- Niche markets can be created from the existing conventional market.

- The project emphasizes the proper management of the environment, which contributes to environmental sustainability in production and productivity of the farms.
- Because all parties benefit from the program, all participants are motivated to carry on with the program.
- Leaders among the farmers in turn will teach and guide the other and newer farmers.
- The program can expand to accommodate other fruits produced by the farmers for the export market or local market.
- Networking of the K-Farm GAP Program will bring more farms and other stakeholders into the program.
- Units of the main program can be broken off to form new farm groups.

The ability to link with the appropriate technical resources (backward links), know who the market players are, and approach marketers (forward links) is the best approach to raising the quality of the crop and marketing it to the best market place. The GAP Program is a dynamic model that is continually refined and upgraded as new technology is used and as the grower and the manager accumulate experience in dealing with problems.

Looking forward

The cultivation of carambola by smallholder farmers can be profitable and sustainable. The K-Farm GAP Program caters to the smallholder farmers, clustering them into efficient production units. The program transfers information and technology to these farmers in a useful and simple manner that they can understand and effectively implement on their farms. Imparting information and techniques is important, as it raises the farmers from a weak position to one where they make their own decision to compete in the higher end markets and become more resilient to changes in market forces.

The program is very cost effective. It does not require large amounts of funding and can take off almost immediately. Farmers join the program freely and willingly because they want to benefit from better pricing and an assured market.

The supply chain mechanism is shortened with this program, allowing the produce to reach the consumer faster and providing more assured financial returns to farmers.

The program needs to work closely with government institutions to use their infrastructure resources. The program could expand to provide an effective marketing link to farmers and make them more independent.

The K-Farm GAP Program is easily duplicated and can quickly transform inefficient farms into productive and competitive farm groups. Marketing access will grow from improving immediate marketing status into niche markets and

export markets. The program can prepare the farmers to accommodate more advanced production technologies and production standards.

The essence of the K-Farm GAP Program's success is an operational management with close monitoring and effective control of the production process, using the resources of commercial networks of K-Farm effectively in the supply chain.

Solutions from the corporate sector

Chief executive officers from a food corporation and a telecommunications firm plus a representative from the United Nations World Food Programme share their experience with successful impacts on food security, poverty, and hunger reduction. Their stories, which are pooled from Session 6B in the Investment Forum, organized by ADB, highlight the linkage of local food production with international markets, building of strong connectivity in the farming network, and corporate innovations in public–private partnerships.

Integrating the food supply chain
The win–win strategy of FieldFresh Foods, India

Raman Ahuja
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A fresh fruits and vegetables marketing firm links with small-scale farmers to strengthen the value chain and improve access to markets—and in the process builds up "agri-entrepreneurs" and rural incomes.

In the last decade, Indian agriculture's contribution to the country's overall gross domestic product has come down dramatically and now stands at a mere 18%. While the contribution to gross domestic product may be relatively small, agriculture still has a very significant impact on the well-being of almost two-thirds of India's population.

The issues that impact Indian agriculture are fairly well known. Indian farmers have small landholdings (over 80% of farmers have less than 1 hectare [ha] of land) and this is declining yearly. And the farmers remain highly dependent on monsoon rains for their livelihood. They face several other challenges that impact their agricultural yields and earnings:

- limited access to quality inputs and farming techniques,
- poor water and soil management,
- high postharvest losses,
- lack of market information leading to difficulty discovering prices, and
- multiple middlemen in the value chain providing costly credit.

Given the foregoing scenario, there is an urgent need to systemically address issues in agriculture in a sustainable manner so as to provide food security in the long run. Any sustainable solution should focus, among other things, on

- creating local employment and enhancing farming income;
- using resources wisely, focusing on land (soil fertility) and water;
- improving crop productivity;
- lowering the cost of production and postharvest losses; and
- building connections to the market.

India's production of fruits and vegetables is second only to that of the People's Republic of China. India's track record with fresh produce exports has been dismal. India's share in global trade is less than 1%, although the country produces over 150 varieties of fruits and vegetables. The reasons for the poor track record are not difficult to fathom. In international markets, the desired freshness (delivered shelf life for consumers) is typically 7 days. The storage conditions in India at farm gate, at processing centers, and at the exit point (whether seaport or airport) are grossly inadequate. Indian produce starts to deteriorate in quality within 24–48 hours of harvest.

Most Indian entrepreneurs were attracted by the huge difference between the international market price and the relatively low cost of cultivation in India. Some entrepreneurs even invested up to $1 million to deliver quality fresh produce. However, an incomplete cold chain combined with poor compliance with international standards led to losses that have made a serious dent in the balance sheet of these entrepreneurs. As a consequence, they had to exit from the business.

The journey of FieldFresh Foods

During the last decade, several leading Indian corporate houses have engaged with the Indian farming community in an attempt to "make a difference" by helping the farmers better manage some of these challenges while contributing to improving rural incomes. FieldFresh Foods Pvt. Ltd. (www.fieldfreshfoods.in) is an equal joint venture between Bharti Enterprises (www.bharti.com) and Del Monte Pacific Ltd., Philippines (www.delmontepacific.com). FieldFresh Foods was established in

August 2004 and is headquartered in New Delhi, India. For the last 3 years, the company has been working with farmers in the states of Punjab and Maharashtra in a manner that is creating a win–win situation for both the farmers and the company.

The next sections briefly chart the journey of FieldFresh Foods' efforts to build a sustainable international business in vegetables, supply fresh consumer packs of baby corn to highly demanding retailers in the United Kingdom (UK) and Europe, and simultaneously deliver significant benefits to small-scale farmers.

Baby corn

FieldFresh Foods has been supplying fresh baby corn in consumer packs to the UK and European markets for the last 3 years and has successfully established brand "India" with UK's leading supermarkets, such as ASDA, Sainsbury's, and TESCO. In the process, the company has become the largest Indian exporter of fresh baby corn, selling over 700 tons in 2009–2010 (handling over 7,000 tons of raw materials). Every day, the company airfreights over 2,000 kilograms, or 12,000 consumer packs, of corn.

Our supply share exceeds 10% of the UK retail market, competing directly with Thailand, the world's top supplier. This performance has been made possible by delivering consistently on quality and service standards in line with the expectations of the international customers.

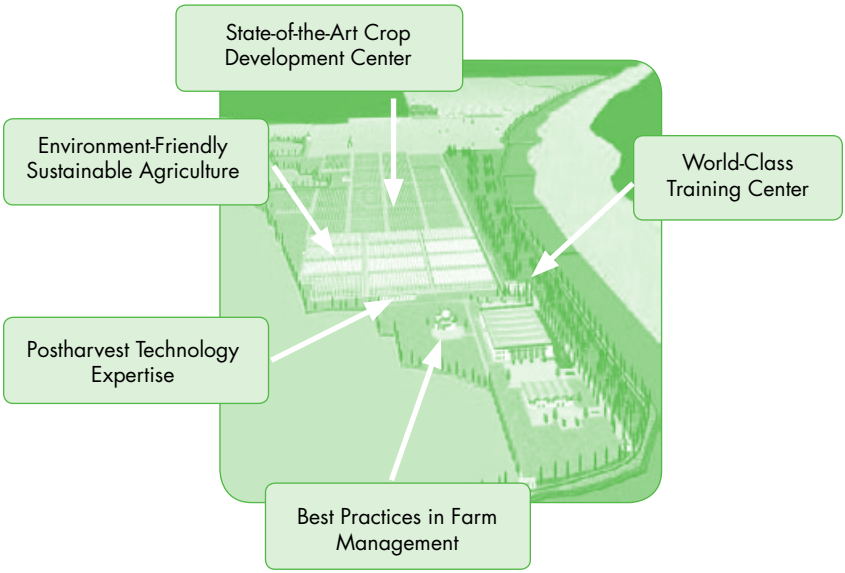
Building trust through public–private partnership

An activity of this dimension can only be embarked upon when the ethos of the organization is rooted in the farming community. "Rootedness" comes through building trust. It was imperative for a new entrant to establish a visible physical foothold. Accordingly, the company, with the support of the State Government of Punjab, established a crop development facility on a 121 ha (300 acre) site in Ladhowal, Punjab, India, with a total investment of $10 million (Figure 1). The facility, FieldFresh Agri Center of Excellence (ACE), has been developed to showcase appropriate farming techniques, supported by postharvest infrastructure.

FieldFresh ACE has an added benefit in that it adjoins the famous Punjab Agriculture University (PAU) in Ludhiana, Punjab. The relationship with a world-class agriculture university serves as a platform to build a continuous cycle of research and development focusing on delivering marketable results. As part of the long-term collaboration with PAU, the company annually sponsors the academic program of four students who are pursuing postgraduate study programs in vegetables. This will equip the students with marketable skills and ensure a steady pipeline of high-caliber talent for scaling up business.

Starting in Punjab, in August 2005, a dedicated group of crop scientists conducted cultivation trials on baby corn at FieldFresh ACE. These trials, spread over 24 months, brought out the most appropriate farming techniques for cultivating baby corn in the identified areas in Punjab. Along with crop trials, the team started

Figure 1: FieldFresh Agri Centre of Excellence (ACE): Platform for appropriate innovation



to work toward understanding the quality and certification requirements of global retailers. The technical team diligently worked to gain GLOBALG.A.P. certification for the FieldFresh ACE facility.

Indian laws do not allow corporate farming or corporate ownership of agriculture land. To build large-scale farming-led business, an organization has to work with hundreds of small-scale farmers. To take this forward, the company engaged with PAU to develop an energetic team of crop advisers to embark on the long and rewarding journey of gaining farmers' trust.

Building farmer connect

FieldFresh Foods has invested significant time and money in training farmers to meet the international standards of quality and compliance. Our farmers are provided exposure to the appropriate farming practices at our FieldFresh ACE farm, and, through our crop advisory team, are sensitized on optimizing the use of resources such as water and minimizing the use of chemical fertilizers and pesticides. Crop rotation and other progressive agricultural practices, such as intercropping with sugarcane and mint, are being promoted to increase the money farmers earn per acre.

Many of the farmers earn their primary livelihood from supplying milk to the dairy industry. The fodder from the baby corn crop is now proven to deliver 5%–10% better milk yield, both in terms of volume and fat content. In times of lower rainfall, the availability of baby corn fodder has become the lifeline for many

farmers. This has helped reduce overall farming costs (which now compare well with the benchmark costs from Thailand). As a result, farmer incomes have gone up on average by 20% per year as compared to alternate crops.

Availability of quality water at the right time is critical to success in agriculture. The water table in Punjab has declined steadily due to intensive farming of rice and wheat. The vagaries of the monsoon have added to depletion of the groundwater resources. FieldFresh Foods is actively engaged in guiding its farmers toward sustainable water management. Columbia Water Forum, part of The Earth Institute of Columbia University (New York), has partnered with PAU, FieldFresh Foods, and leading Indian agriculture companies to launch the India Water Forum, focusing on reducing water usage in agriculture to ensure sustainable supply for the nation's water requirements.

FieldFresh Foods is helping over 100 farmers to shift from water-intensive crops such as rice to cash crops such as vegetables. The company also demonstrates the benefits of using water as a nutrient and not as a free resource. The farmers are encouraged, through the use of appropriate equipment such as tensiometers and soil moisture probes, to gauge the precise level of moisture in their soil before they irrigate so that the fields are watered only when the soil needs it. Traditionally, farmers work by sight and flood the field whenever it appears dry to the naked eye.

Two of the biggest uncertainties farmers face are weather and market access for the crop. In partnership with leading insurance companies in the government and private sector, FieldFresh Foods has launched a weather index-based insurance product that will support the farmer if the weather pattern changes. The product has been designed after several rounds of consultations with farmers and other experts. The farmer does not have to submit lengthy paperwork or take help from insurance surveyors. The claim automatically accrues when the weather conditions as recorded by the local weather station are outside the agreed parameters for the crop. The farmers are very positive about this development and they have embraced it wholeheartedly.

For perishable products, the risk of market access becomes more pronounced with the passage of time. The prime advantage of a contractual agreement between FieldFresh Food and partner farmers is that the company provides a guarantee to purchase all the produce grown, within specified quality and quantity parameters. The relationship also provides farmers with free-of-charge access to a wide range of managerial, technical, and extension services. The price along with the specifications is indicated in writing in advance.

Our operations team has worked with farmers to demonstrate the appropriate practices developed at our farms. FieldFresh Foods, along with its partner farmers, became one of the very few Indian companies to obtain GLOBALG.A.P. certification for vegetables. A process-driven approach with measurable outcomes has increased the farmers' confidence and incentives to enhance their income by delivering better quality produce. Most importantly, the revenue from crop sale is

directly transferred into the farmer's bank account within 10 days of delivering the produce, thus building trust and transparency in the relationship.

To provide adequate support to the large-scale efforts with farmers, the company has invested in a world-class postharvest facility (pack house) at FieldFresh ACE. This facility has all the requisite temperature storage rooms, automated and conveyor-driven material handling equipment, and a fully equipped microbiological laboratory. The pack house has been certified as British Retail Consortium (BRC) compliant.

FieldFresh Foods has been able to achieve and ensure year-round availability of fresh baby corn to the UK supermarkets in an extremely short span of time. The track record of the company and farmers is that over 99% of all the produce packed and exported is rated as of high quality.

Upscaling operations: Developing rural micro and small enterprises

In a country where most of the farming is done by small-scale farmers, scaling up operations requires developing a variety of capabilities. From January 2009, the company has embarked on a capacity development exercise of a different kind. In the state of Maharashtra, FieldFresh Foods invested (financially and managerial time) in lead farmers who have been trained to manage a large part of the value chain. These lead farmers are our "agri-entrepreneurs." They are our partners in building a sustainable value chain. To qualify to be an agri-entrepreneur, a person must meet three criteria:

- be a local farmer of good repute,
- have a quality orientation, and
- want to build a long-term business based on core farming activities.

Depending on the capacity of the agri-entrepreneurs, the company has provided short-term funding up to $200,000. In addition to their own farming activities, the agri-entrepreneurs provide several core services:

- managing crop demonstration plots;
- recruiting and managing a large group of farmers, including managing the commercial relationship;
- providing crop advisory services;
- co-investing and managing postharvest infrastructure; and
- providing logistics support.

Each agri-entrepreneur has built a small organization, recruiting 10–20 rural youths, that provides services to the farmers to support building the farmer–connect program. This organization is supported by a dedicated team from FieldFresh Foods. Today, our company works with over 3,500 small-scale farmers (with an average landholding of less than 1 ha), growing baby corn on nearly 1,600 ha (4,000 acres) through contract farming. More than 85% of the farmers are managed by agri-entrepreneurs.

The business activities of each entrepreneur have led to an increase in farmer incomes by up to 20%. The work has also generated significant local employment

opportunity for local women who are employed at the farms and in the postharvest operations (at the packing house).

Lessons learned and challenges ahead

Farmers are trusting and are very willing to learn. However, the method of learning has to be based on small-scale pilot tests conducted in the vicinity of the growers. Farmers need to see the proof that a concept works before they will adopt a new cultivation program. As it is inadequate to have only one facility like FieldFresh ACE, which is located in Punjab, the FieldFresh team continually invests with progressive farmers to build demonstration plots. The farming practices on the demonstration plots are driven by what is locally available and the best practices observed in other locations. The risk associated with output from the demonstration plots is borne by the company.

It is absolutely critical that the organizations dealing with the farming community are seen to be demonstrating the highest level of integrity—whether in sharing knowledge or in accepting mistakes. FieldFresh, in its journey to build a national footprint, has staffed its teams with people from the local area. These employees are coached on an ongoing basis. The company's leadership—from shareholders down—makes it a point to participate in farm-related activities. Every event is a cause for celebration with our farmers. Farmers have come to accept that our company is working toward improving the long term and changes will come in small bites.

The concept of trust, while easily understood, is difficult to spread in a uniform way, especially when network size increases. This is a key challenge for the employees. For our program to be successful, it is absolutely necessary that all partners (agri-entrepreneurs, universities, banks, etc.) demonstrate the same level of confidence to the farmers. To bring this uniformity, the company has branded its services to the farmer. We believe that, over a period of time, combined with transparency and through a set of positive experiences, farmers will recognize the reliability of our brand (services) and the services of our partners.

Simultaneously, we are constantly working toward a transparent organization of people within FieldFresh. The teams are encouraged to share and have access to everybody in the organization. The incentive programs are designed to reward the team and not the individual. Training, both locally and internationally, allows each individual to develop his or her skill base. Pride in everything that we do is a very key aspect of the daily routine of our teams.

The international market for our product basket is limited. Hence, there is now an urgent need to expand the range and/or find new markets. The Indian market for quality fresh produce remains underserviced. The growing Indian consumer base and rising income levels are creating a large unmet demand. However, the slow pace at which modern retailing is developing in India has made it difficult for corporations engaged in fruits and vegetables to reach out to the consumer base.

We believe that this will take 3–5 years to evolve. Our pace of activity with the farmers will need to be moderated to reflect that development.

At the early stage of building a business, the company has consciously not engaged with local government organizations. This has been done to ensure that the core focus of building a viable business model remains intact. In the next stage, FieldFresh will actively engage with civil society organizations to bring the benefits of their services to our farmer network. This will be a key lever in adding greater value to the entire network while leveraging the existing infrastructure of these organizations.

Our chosen model of building linkages with smallholder farmers is scalable. Many small clusters are being identified and developed on the same lines. Human intervention will continue to be needed in activities that engender trust in every transaction. The skill base will grow as agri-entrepreneurs invest in local youth. Small-scale farmers will hopefully see long-term benefits, stay with farming as an occupation, and not sell their land to developers. Throughout this process, the focus of the company will remain twofold: develop market linkages for crops and build strong connectivity in the farming network to ensure that the desired changes and pace of change are hastened.

"Linking Indian fields to the world"

What commenced as a vision of "linking Indian fields to the world" has become a reality for FieldFresh Foods. In 2010, which is the fourth year of our contract farming program, we will strive to grow our business by 50%, thereby exporting nearly 1,100 tons of baby corn from India to the most competitive, demanding, and quality-conscious markets in Europe. Most importantly, we will be building a solid foundation for the future, with over 5,000 partner farmers in two of India's most progressive agricultural belts in Maharashtra and Punjab.

This successful partnership has demonstrated that, indeed, both the farming community and the corporate sector can gain by working together and that more farmers can be brought into the fold as the scale of the business increases multifold in the coming years. That "the proof of the pudding is in the eating" is certainly true for us—for both the farmers who have evidenced reliability and profitability along with trust and transparency in this relationship as well as for our company, which sees a solid and scalable long-term partnership with the farming community.

Hello, markets!

How the e-Choupal makes connectivity work

Shailesh Naik
General Manager and Head
E-Choupal Channel, ITC Ltd.

A conglomerate in India brings rural farmers into the internet age via computerized hubs in villages—the e-Choupal—and empowers them with up-to-date agricultural information and increased efficiencies.

ITC is one of India's foremost private sector companies, with a market capitalization of over $18 billion and a turnover of $5.1 billion. Rated among the world's leading companies by *Forbes* magazine, ITC ranks third in pretax profit among India's private sector corporations. ITC has a diversified presence in cigarettes, hotels, paperboards and specialty papers, packaging, agribusiness, branded apparel, packaged foods, confectionery, personal care, and other fast-moving consumer goods.

As a corporate citizen with enduring relationships in rural India, ITC has a history of collaboration with communities and government institutions to enhance farm productivity and the rural resource base. ITC's commitments in agricultural research and development and knowledge sharing have spanned vital aspects of competitiveness—efficient farm practices and soil and water management. ITC drives its corporate social responsibility work through Mission Sunehra Kal, a rural capacity-building program fostering local initiatives to develop water and forest resources, open up new nonfarm livelihoods, empower women economically, and expand primary education.

The company's flagship "e-Choupal" initiative (*choupal* is Hindi for traditional village gathering place) is enabling Indian agriculture to significantly enhance its competitiveness by empowering Indian farmers through the power of technology. By linking knowledge and technology transfer to the creation of economic and social capacity, ITC has brought a new dimension to rural development. This transformational strategy, which has already become the subject matter of a case study at Harvard Business School, is expected to progressively create for ITC a huge rural distribution infrastructure, significantly enhancing the company's marketing reach.

The e-Choupal has been recognized the world over and won numerous awards, including the United Nations Industrial Development Organization (UNIDO) award in 2008 for exemplary initiatives in agriculture.

Business context

The paradox of Indian agriculture

Surplus yet scarcity. Granaries overflow with food stocks of over 60 million metric tons, yet the unprofessional business environment has made the sector unattractive to modern companies and blocked their influence in rationalizing the market. Agriculture is economically and socially vital to India. It contributes 23% of the gross domestic product, feeds a billion people, and employs 66% of the workforce. Agriculture's share of gross domestic product has shrunk steadily to 23%, but it remains a critical component of the economy

Yet despite this economically vital role, Indian agriculture has until recently been regulated in an archaic fashion that limits its productivity. Nonoptimal farming practices and capricious weather patterns left post-Independence India with an underperforming agriculture sector, acute food shortages, and dependence on food imports. Legislation from this period brought heavy government intervention in agriculture, including control of land ownership, input pricing, and regulation of product marketing. The result was corrupt and inefficient systems and persistent starvation.

High production yet impoverished producers. Despite great strides in agricultural productivity under the Green Revolution, by the mid-1970s, the Indian farmer had not progressed correspondingly (Figure 1). The typical Indian farm is a very small-scale operation, with total landholdings often measured by fractions of an acre. Unable to realize economies of scale, most Indian farmers are very poor as a result of land redistribution policies.

In search of value

Understanding value gaps

The market (*mandi*) system in India does not serve the farmer well, and is burdened by many inefficiencies.

Lack of information on when to sell leads to lower output prices and higher sunk costs. The farmer does not have the resources to analyze or exploit price trends; the timing of a sale may not result in the optimal price for the crop. Moreover, since the actual sale price is determined at auction, by the time the farmer gets the price, it is too late to go to another market to make a sale.

Higher value-chain cost due to inefficient load management and poor supply chain practices. Due to inefficient management of deliveries, farmers often have to stay overnight near the market. Most crops are displayed in open air courtyards and subject to weather vagaries. The multiple points of handling in

the supply chain require the produce to be bagged, which takes 4–5 times longer to be unloaded at the processing plant than unbagged produce. Traders generally do not have the capacity to store and manage different qualities and grades of produce. Pricing is set locally at the markets, and is not reliably tracked or reported nationally, resulting in a lack of information, reducing the opportunity for arbitrage and leading to market inefficiency. In addition, regulatory restrictions tend to limit arbitrage to small geographic areas.

Lack of fairness, transparency, and respect. The inspection process is unscientific and often arbitrary, tending to favor the buyer, and generally does not provide an incentive to farmers to invest in better seed or farming practices. In addition, farmers find the auction process demeaning. Agents belong to a close-knit community that is socially and economically distinct from the farmers' community. They collude in trade practices that uniformly favor agents and exploit the farmers.

The farmers also bear the cost of bagging and weighing the crop, which is done by market laborers—part of whose compensation is the sale of spilled produce. Needless to say, these laborers ensure that part of each lot is spilled. Farmers feel that the weighers consistently underweigh their produce. Historical intimidation and long queues waiting behind them dissuade the farmers from protesting. To add to this exploitation, the farmer is never paid the full purchase price up-front but is asked to return to the market for the remainder. Farmers are not paid interest on the remaining sum, although agents are paid usurious rates for the privilege of delayed payment, and repeating the trip to the market costs time and money. As the crop has already been delivered, the farmers are at the agents' mercy.

The market system is also a problem for trading companies like ITC because of the agent's control and the resulting distortions of price and quality. The agent

Figure 1: Vicious cycle that traps the Indian farmer

often mixes the different quality of crops together and charges the trading company a single higher price.

Understanding value plus and gaps in distribution

The village traders service the spectrum of farmers' needs. The traders are a centralized provider of cash, seed, fertilizer, pesticides, and the only marketing channel. As a result, the traders enjoy two competitive benefits. First, the traders' intimate knowledge of the farmer and village dynamics allows them to accurately assess and manage risk. Second, the traders reduce overall transaction costs by aggregating services. The linked transactions reduce the farmers' overall cost in the short term but create a cycle of exploitative dependency in the long term.

Vision and planning behind the e-Choupals

The challenge for ITC was to create a business model that would

- deliver an end-to-end solution, with the farmer (1) having the freedom of choice to sell produce and buy inputs, and (2) able to take an informed decision; and
- provide effective service, (1) notwithstanding the problems of fragmentation, dispersion, heterogeneity, and weak infrastructure; and (2) at low cost.

Implementing and managing e-Choupals is a significant departure from commodities trading. Through its tobacco business, ITC has worked in Indian agriculture for decades, from research to procurement to distribution. ITC's translation of the tactical and strategic challenges it faced and its social commitment into a business model demonstrates a deep understanding of both agrarian systems and modern management. This is based on three guiding principles:

- reengineer, do not reconstruct;
- address the whole, not just one part; and
- seek an information technology (IT)-driven solution.

From the conception of the model, an IT-based solution was recognized as fundamental to optimizing effectiveness, scalability, and cost. IT is 20% of all the effort of ITC's e-Choupal business model, but is considered the most crucial 20%. Two goals are envisioned for IT:

- **Deliver "real-time" information independent of the transaction.** In the market system, delivery, pricing, and sales happen simultaneously, thus binding the farmer to an agent. The e-Choupal was seen as a medium of delivering critical market information independent of the market, thus allowing the farmer an empowered choice of where and when to sell the crop.
- **Facilitate collaboration among the many parties required to fulfill the spectrum of farmer needs.** As a communication mechanism, this goal is related to the commitment to address the whole system, not just a part. ITC did not hesitate to install expensive IT infrastructure in places that

most people would be wary of visiting overnight. It is a manifestation of the integrity of rural value systems that not a single case of theft, misappropriation, or misuse has been reported among the almost 6,500 e-Choupals.

The e-Choupal business model

The model is centered on a network of e-Choupals—information centers equipped with a computer connected to the internet, located in rural farming villages. The e-Choupals serve both as a social gathering place for exchange of information and an e-commerce hub. A local farmer acting as a coordinator (*sanchalak*) runs the village e-Choupal, and the computer is usually located in the coordinator's home. ITC also incorporates a local commission agent known as the collaborator (*samyojak*) into the system as the provider of logistical support. ITC has plans to saturate the sector in which it works with the e-Choupals, so that a farmer has to travel no more than 5 kilometers (km) to reach one. The company expects each e-Choupal to serve about five villages within a 5-km radius.

The critical element of the e-Choupal system, and the key to managing the geographical and cultural breadth of ITC's network, is the coordinator. ITC channels virtually all its communication through the local coordinator. Recruiting a local farmer from the community for this role serves several purposes:

- For generations, the Indian farmer has been betrayed by individuals and institutions. Trust is the most valuable commodity in rural India. No transaction will happen without trust, irrespective of the strength of the contract. The coordinator is selected to provide this vital component in ITC's system.
- ITC need not invest in building and securing physical infrastructure such as a kiosk for housing the e-Choupal computer.
- The coordinator is trained in computer operation and can act as a familiar and approachable human interface for the often illiterate farmers and other villagers.
- ITC expects to leverage the profit-making power of the small-scale entrepreneur.
- Coordinators indicate three equally weighted motivations for assuming their role: a means to help their community, a profitable business for themselves, and a means of having access to a functional computer.

The coordinator receives a commission for every transaction processed through the e-Choupal and benefits from increased social status that accompanies the position—a significant advantage in rural Indian life. ITC insists that coordinators should not give up farming, for this would compromise the trust that they command. To help ensure that coordinators serve their communities and not just themselves, ITC projects the role as a public office, hence the title

"coordinator." At a public oath-taking ceremony, the coordinator vows to serve the farming community through the e-Choupal.

Successful coordinators usually have a number of common characteristics, including risk-taking ability and the willingness to try something new, ambition, and the aspiration to earn additional income through the e-Choupal. Coordinators are usually of median wealth and status in their communities, can read and write, and are part of an extended family large enough so that they can find time to service the e-Choupal.

Coordinators are trained at the nearest ITC hub. They receive education on basic computer use, the functions of the e-Choupal website, basic business skills, and quality inspection of crops. For the sale of products through e-Choupal, the coordinators receive product training directly from the manufacturer, with ITC involving itself only in product design and facilitation. Nonetheless, their role requires considerable entrepreneurial initiative and entails some operational costs, such as electricity.

Selecting and training the coordinators is just the first step. Most do not have retail experience and may lack motivation to actively promote ITC products. ITC employs a variety of motivation techniques to encourage sales. One technique is to hold a ceremony where coordinators are presented with their annual commission checks and public announcements of earnings are made. Stories of how coordinators spent past commissions demonstrate the income potential and spur nonperformers to work.

A secondary but still important role is played by the collaborators (*samyojaks*), or cooperating commission agents. The collaborators earn income from ITC by providing logistical services that substitute for the lack of rural infrastructure and by providing information and market signals on trading transactions. In effect, ITC uses agents as providers of essential services, not as principals in a trading transaction. They play an especially important role in the initial stages of setting up the e-Choupals because they know which farmers grow soya, what kind of families they have, what their financial situation is, and who is seen as "acceptable" in the villages and might thus make a good coordinator.

ITC is strongly committed to involving collaborators in the ongoing operation of the e-Choupal system, allowing them revenue streams through providing services such as management of cash, bagging, and labor in remote ITC procurement hubs, handling of market paperwork for ITC procurement, and acting as licensed principals for the retail transactions of the e-Choupal.

Because the e-Choupal system bypasses the agent-controlled markets and has considerably reduced commission income, why do agents agree to cooperate with ITC? First, the company has made it clear that they will continue to buy produce through the markets. Second, the company offers significant commissions for collaborators' services. Finally, the agents are fragmented and fear that if they do not agree to work with ITC, another agent will gain from e-Choupal revenues.

Creating value propositions

Pricing. The previous day's market closing price is used to determine the benchmark—the fair average quality price—at the e-Choupal. The benchmark price is static for a given day. This information and the previous day market prices are communicated to the coordinators through the e-Choupal portal. The collaborating commission agents at the market are responsible for entering daily market prices into the e-Choupal. If and when the internet connection fails, the coordinator calls an ITC field representative.

Inspection and grading. To initiate sales, farmers bring a sample of their produce to the e-Choupal. The coordinator, based on his or her assessment of the quality, makes appropriate deductions (if any) to the benchmark price and gives the farmer a conditional quote. The coordinator performs the quality tests in the farmer's presence and must justify any deductions to the farmer. The benchmark price represents the upper limit on the price a coordinator can quote. These simple checks and balances ensure transparency in a process where quality testing and pricing happen at multiple levels. If the farmers choose to sell their soya to ITC, the coordinator gives each a note containing his or her name, village, particulars about the quality tests (foreign matter and moisture content), approximate quantity, and conditional price.

Weighing and payment. The farmers take the note from the coordinator and proceeds with the crop to the nearest ITC procurement hub, ITC's point for collection of produce and distribution of inputs sold in rural areas. Some procurement hubs are simply ITC's factories that also act as collection points. Others are purely warehousing operations. ITC's goal is to have a processing center within 30–40 km of each farmer. At the ITC procurement hub, a sample of the farmer's produce is taken and set aside for laboratory tests. A chemist visually inspects the soybean and verifies the assessment of the coordinator.

This is the only test assessment before the sale. Laboratory testing of the sample for oil content is performed after the sale and does not alter the price. The reason for this is that farmers, having historically been exploited, are not immediately willing to trust a laboratory test. Pricing is therefore based solely upon tests that the farmers can understand. The farmers accept foreign matter deductions for the presence of stones or hay, based upon the visual comparison of their produce with that of their neighbors. They will accept moisture content deductions, based upon the comparative softness of their produce when they bite it. ITC is working to change farmers' attitudes toward laboratory testing. ITC is developing an appreciation of better quality by using the subsequent lab tests to reward farmers with bonus points if their quality exceeds the norm. At the end of the year, farmers can redeem their accumulated bonus points through the e-Choupal for farm inputs or contributions toward insurance premiums. After the inspection, the farmer's cart is weighed on an electronic weighbridge, first with the produce and then without. The difference is used to determine the weight of the produce.

Hub logistics. After the inspection and weighing are complete, the farmer collects full payment at the payment counter. The farmer is also reimbursed for transporting the crop to the procurement hub. Every stage of the process is accompanied by appropriate documentation. The farmer is given a copy of lab reports, agreed rates, and receipts for his or her records. The collaborators, who are adept at handling large amounts of cash, are entrusted with the responsibility of payment except at procurement centers near large ITC operations, where ITC handles cash disbursement. Collaborators also handle much of the procurement hub logistics, including labor management at the hub, bagging (if necessary), storage management, transport from the hub to processing factories, and handling market paperwork for the crops procured at the hub. For their services in the procurement process, the collaborators are paid a 0.5% commission.

Procurement → Connectivity = Farmer Empowerment

Prior to the introduction of e-Choupal, farmers' access to agricultural information was incomplete or inconsistent. The only sources of information were word of mouth within the village and the commission agent. The e-Choupal allows farmers daily access to prices at several nearby markets. Some e-Choupal coordinators have taken this a level further by accessing external pricing sources such as the Chicago Board of Trade to track global trends and determine the optimum timing of sales. Moreover, through the e-Choupal, farmers have access to prices and make the critical decision of when and where to sell their crop. Both factors work together to provide the farmers a better price for their crops.

Under ITC's system, farmers no longer bear the cost of transporting their crops to the market and are instead reimbursed for transport to the procurement hub. The transaction at the ITC hub is also much faster than at the market, usually taking no more than 2–3 hours. Moreover, ITC's electronic weighing scales are accurate and not susceptible to sleight of hand like the manual weighing system at the market. The system also does not require produce to be bagged, avoiding the associated loss due to intentional spillage. Thus, the e-Choupal system has logistical and transaction efficiencies.

Finally, the ITC procurement center is a professionally-run operation where the farmer is treated with respect and served as a customer. ITC's recognition that farmers are not simply agricultural producers but integral partners in the supply process has elevated the level of respect paid to them. Simple provisions such as a shaded seating area where farmers can sit while waiting for their paperwork serve as indicators of ITC's respect for farmers and their produce. Though intangible, the self-confidence created by this professional treatment is affecting the way farmers conduct themselves. Coordinators and even commission agents have noted a change in farmers' attitudes.

The incremental income from a more efficient marketing process is about $6 per ton, or an increase of about 2.5% over the market system. Farmers also can use the information available to them through the e-Choupal to improve

yields. Moreover, the seed, fertilizer, and consumer products offered them through e-Choupal cost substantially less than through other local sources such as village traders. Thus, there are meaningful net economic benefits to farmers, and it is having a measurable impact on what farmers choose to do. In areas covered by e-Choupals, the percentage of farmers planting soya has increased dramatically, from 50% to 90% in some regions, while the volume of soya marketed through markets has dropped by as much as 50%.

ITC gains

The commissions paid to the agents under the market system were not excessive but because of inefficiencies, the true cost of intermediation through the market system was 2.5%–3.0% of procurement costs. While retaining commissions paid for the coordinators' services, the 0.5% commission paid to them is significantly less than the costs associated with the market system. Direct reimbursement of transport costs to the farmer is estimated to be half of what ITC used to pay the commission agents for transport to their factory. Removal of intermediary manipulation of quality and the ability to directly educate and reward quality in the customer base results in higher levels of quality in e-Choupal procurement. This produces higher oil yields, which in turn lead to higher profits for ITC.

The e-Choupal also allows ITC to develop long-term supplier relationships with farmers and attain some degree of supply security over time. Risk is also managed in the e-Choupal system by a far stronger information infrastructure. Coordinators and collaborators working on behalf of ITC provide excellent bottom-up information on pricing, product quality, soil conditions, and expected yields. This allows ITC to better plan future operations.

Sustaining commercial volume

"Virtual vertical integration" can only work if there is a continuous flow of information between the e-Choupals and ITC. Because of the number and physical dispersion of the e-Choupals, this communication must be initiated by the coordinators. If their motivation to communicate with ITC diminishes, the channel will still function for procurement but will lack the vitality to supply risk management, distribution, or product design. Maintaining continuous commercial flow keeps the coordinator motivated to spend time and money calling the ITC representative to ask about new products, convey village demand, and providing ITC with local updates.

An example of the power of local information was seen early in e-Choupal implementation. A competitor attempted to divert produce coming to the ITC factories by stationing representatives on the roads leading up to the plant. This person would stop farmers on their way to the ITC hub and offer them a price higher than the ITC rate at the competitor's plants. Farmers alerted the coordinators and they in turn provided ITC with the information necessary to address the situation. Coordinators thus provide an essential role in the chain of communication.

ITC maintains commercial volumes by sequencing procurement and sales year-round, thereby securing the continuing flow of commission checks through e-Choupals. Purchases and sales have been arranged so that *kharif* (the cropping season that coincides with India's monsoon, July through October) and *rabi* (the winter cropping season in irrigated areas) inputs and procurement maintain a steady stream of revenue for coordinators.

Scaling the model

Currently, 6,500 e-Choupals cover over 35,000 villages and 50 million people. Profitable reengineering requires the unambiguous understanding of value provided, the circumstances in which they are applicable, and the revenues they are capable of generating. ITC's model identifies three sources of value for the company that can help scale the model.

Crop-specific intervention. ITC recognized that agrarian systems vary by crop. This means that the inefficiencies in the supply chain, the corrections required from e-Choupal, and the magnitude and timing of the resulting revenues will differ by crop. For example, the systems, and consequently the e-Choupal models and payback streams, are very different for coffee and shrimp from those for soya. ITC's goals for soya intervention reflected this nuanced analysis and the project was targeted with recovering the entire cost of infrastructure from procurement savings.

Low-cost last mile. The same system of physical and information exchange that brings produce from the village can be used to transfer goods to the villages. As the infrastructure has already been paid for by procurement, it is available at marginal cost for distribution. This ties in nicely with ITC's larger goal of transformation into a distribution superhighway. ITC's current channels reach areas with populations of 5,000 and more. The e-Choupals allow penetration into areas with populations less than 5,000. Products such as herbicides, seeds, fertilizers, and insurance policies as well as soil testing services are sold through e-Choupal.

The e-Choupal as a distribution channel begins in agriculture but extends well into consumer goods and services. In the traditional channel, comprised of mobile traders and cycle-based distributors, farmers lack the resources to make informed purchasing decisions. More often than not, traders and distributors do not understand the farmers' issues and may sell them products and services that do not satisfy their needs. With many larger companies hesitating to serve the rural market, farmers often do not have variety in their choice of products and services. This lack of choice means that not only are farmers forced to buy whatever is available, they often must pay a premium for those products.

Intelligent first mile. The global resources, best practices, and remunerations that the e-Choupal brings to farmers have encouraged innovation and provided an avenue to see their ideas realized. This illustrates ITC's vision of using e-Choupal as the "intelligent first mile." Farmers are now coming up with products and services that ITC could provide to further improve operations. ITC's objective is not to

be a platform provider for the sale of third-party products and services, but rather a network choreographer that orchestrates bidirectional demand and supply of goods through a collaborative business model.

In addition, the information infrastructure implemented by ITC can be used to enhance its business decision making, improve risk management, and identify opportunities for "cross-selling or upselling"—offering customers new or related products and purposes, in order to make more sales. The company can leverage detailed transactional data and transform it into actionable knowledge. Data mining and data warehousing will help company executives to better understand the behavior of their customers and identify unfulfilled needs and ways to serve them efficiently.

The communication infrastructure compensates for the lack of physical infrastructure needed for marketing products and services in rural India. It enables rapid, low-cost information dissemination and a trusted brand for introducing new products, while minimizing the need for a traveling sales force. Online ordering and order management eliminate the need for physical storefronts. The IT infrastructure and local coordinator provide customer intelligence, thus maximizing customer satisfaction and profitability.

Additional services: Credit and insurance

Farmers' low income and difficulty in accessing credit severely limit their capacity to pursue opportunities within and outside the agriculture sector. Access to credit has long been considered a major poverty alleviation strategy in India. Demand for rural credit is estimated at $31.6 billion (Rs1.43 trillion). The Indian government has implemented a number of subsidized credit-related programs, such as the Integrated Rural Development Program that has a large credit component. But the impact of these programs has not matched the resources expended. The loans were not tailored to meet individual needs and the program lacked the support systems necessary to help farmers. Many financial institutions are hesitant to serve rural India due to lack of credit history; high delivery, transaction, and administration costs; and a perception of high risk that leads to high borrowing costs imposed on farmers. ITC proposes to address these problems through e-Choupals and partnerships with financial institutions to capture needed information and offer new products.

Transaction and administration costs. For major financial institutions, transaction costs involved in servicing the rural market have been high because of the difficulty in reaching the market. The e-Choupal can help overcome this problem by leveraging the IT infrastructure and the coordinator network, thereby lowering administrative costs.

Insurance and risk management services. Insurance products have been selected to deal with rural cash cycles. There is recognition that in bad years, farmers may not be able to pay the insurance premium.

ITC uses the e-Choupal web infrastructure to set up and issue electronic reminders for premium payments. This service enables the insurance system to reach out to farmers faster.

The social impact of e-Choupal

A major impact of the e-Choupal system comes from bridging the information and service gap of rural India. Agricultural research centers (such as the Indian Council for Agricultural Research), universities, and other agencies in India have developed several practices and technologies to improve productivity and crop quality. The impediment to implementation has been affordable, large-scale dissemination of this knowledge.

The e-Choupal system leverages technology that can reach a wide audience literally at the click of a mouse. The constant presence of the coordinators, who themselves are farmers who apply these techniques, ensures that the practices actually make their way from the website to the field. The e-Choupal website and e-commerce system provide information and services for some key areas:

- **Weather.** Other public sources generally provide only aggregated state-level information. The e-Choupal's localized weather information is intelligently coupled with advice on the activities in the agricultural lifecycle. The availability of accurate rain information has cut losses by more than half.
- **Agricultural best practices.** Scientific practices organized by crop type are available on the website. Additional questions are answered by experts who respond to e-mails from the villages.
- **Customized quality solutions.** After sale of a crop is completed, ITC performs laboratory testing of the sample collected. Based on these results, farmers are given customized feedback on how they can improve crop quality and yield.
- **Intelligent product deployment.** The optimal application of inputs such as fertilizers and pesticides is relative to the soil and crop. ITC's "full-service" approach couples the input sale with the information on the website and services such as soil testing.

A second major area of impact stems from the ability of the e-Choupal system to open a window to the world and thus impact the future of the villages in which they operate. Computers are bringing the same resources to villages as they brought to urban India. This, coupled with higher incomes and changes in farmers' attitudes, is causing several shifts in the social fabric of village life. Some coordinators use the internet to chat extensively among themselves about the status of operations and agriculture in their villages.

The e-Choupal model shows how the simple creation of connectivity and choice can play a major role in rationalizing markets and increasing the efficiency of an agricultural system, and how to do so in ways that benefit farmers and

encourage them to reduce waste, improve productivity, and hence increase food security for the country.

ITC's example also shows IT's key role in helping to bring about transparency, increase access to information, and catalyze rural transformation, while enabling efficiencies and low-cost distribution that make the system profitable and sustainable.

Critical factors in the apparent success of the venture are ITC's extensive knowledge of agriculture, the effort ITC has made to retain many aspects of the existing production system, including retaining the integral importance of local partners, the company's commitment to transparency, and the respect and fairness with which both farmers and local partners are treated.

Harnessing public–private partnerships in Asia

The UN World Food Programme

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Chronic hunger, not emergencies, claims the most lives, and the world's largest humanitarian agency continues to innovate its toolbox to provide solutions to break free of the "hunger trap" and save lives.

The World Food Programme (WFP) is the world's largest humanitarian organization and hunger solutions agency. WFP provides the United Nations (UN) and the international community its logistics lifeline and saves lives through fast, efficient, and effective food support and nutrition interventions.

In 2010, we aim to provide food assistance for 90 million people in more than 74 countries affected by conflict, storms, droughts, displacement, financial crisis, and various shocks that leave them without food. About 84 million of these people are women and children. From 2009–2010, WFP could not have reached these hungry and vulnerable people without the generous support of nations, private donors, and individuals who gave $1.88 billion during a time of economic hardship. WFP is 100% funded and supported by voluntary contributions—a testimony to the confidence in our ability to save lives and livelihoods.

It is chronic hunger, not emergencies, that claims the most lives. Ten million people die every year due to hunger and hunger-related diseases. That is more than AIDS, malaria, and tuberculosis combined. Only 8% of the world's population are victims of high-profile earthquakes, floods, droughts, and wars. There are at least 1 billion hungry people in the world who do not make the headlines—more than the combined populations of the United States, Canada, and the European Union. These are the unemployed inhabitants of urban slums, the landless farmers tilling other people's fields, the orphans of AIDS, the sick, and malnourished mothers who give birth to low birth weight babies in off-the-grid communities.

Approximately 75% of all victims of hunger live in villages of Asia and Africa, and 25% live in shanty towns on the periphery of the biggest cities in developing countries. An estimated 1 billion people worldwide are hungry. It is also estimated more than 60% of the world's hungry are women. The food price spike in mid-

2008 and its associated negative impacts on poor people amplified the need to reverse a decline in investment in agriculture over the last few decades. And the outlook for food prices and supply remains uncertain—due to factors such as climate change, evolving energy, and financial markets.

The face of hunger in Asia

In recent years, the Asian region has experienced continuing localized food shortages related to natural disasters and emergencies. The regional and global response to such events resulted in major disaster response and relief efforts that raised short-term nutritional needs of vulnerable populations in the affected area. The challenges posed by long-term food security issues such as chronic hunger are rarely addressed with similar attention and vigor. This poses a major problem, because most of Asia's malnourished households are victims of an intergenerational "hunger trap" unrelated to a particular natural disaster. Food insecurity can lead to a dangerous cycle where malnutrition causes development and long-term health issues that hinder one's ability to reach full social and economic potential. The result is an inability to break free of the hunger trap and continued strain on succeeding generations.

The cost of hunger is not limited to food-insecure households. The long-term knock-on effects of malnutrition put a high demand on government services such as health care, education, and social welfare programs. Further, victims of the hunger trap are inhibited from contributing their full potential to society. As a result, beyond ensuring food as a basic human right, effective policies to reduce chronic hunger should be considered cost-efficient approaches. To appropriately budget for a broad hunger alleviation strategy, governments require accurate information on the true cost that hunger takes on government resources.

While a number of countries in Southeast Asia have made progress in terms of economic growth during the last decades, food security remains a major problem in the region. As the region moves forward, it is essential that policy makers, donors, and civil society organizations focus on reducing chronic and hidden hunger, which can fall between the cracks in today's complex policy environment.

Changes over the last 2 years highlight the difficulties many of Southeast Asia's poor face in attempting to sustain healthy food intake for themselves and their families. In Indonesia, the world's fourth largest country, a 2007 United States Department of Agriculture report found that the average person spends 50% of her or his income on food. During the 2008 hike in food prices, this percentage quickly grew and dramatically increased the number of Indonesians struggling to access food. Similar examples can be found throughout the Southeast Asian region. While food prices eventually came down, the ensuing financial crisis impacted average income. As member states of the Association of Southeast Asian Nations (ASEAN) rebound from the financial crisis, countries must ensure that policies are

targeted to restore food security in populations drawn into undernourishment by recent events as well as those who have long suffered from chronic hunger.

As signatories to the Millennium Declaration, Asian countries are committed to reducing hunger. While progress has been made, chronic hunger remains a major constraint in the Asian region. In today's complex policy environment, it is essential that chronic hunger remains a key focus on national agendas with appropriate budget allocations. Further, international donors must be aware of the true cost of hunger to better prioritize aid and development interventions. The private sector can no longer work with a business-as-usual mindset and must work toward ensuring that the "bottom of the pyramid" have access to adequate food and, most importantly, nutrition.

For the world to deliver on its goal of halving poverty and hunger by 2015, there is an urgent need for more investment in developing countries to boost agricultural productivity, improve access to food markets, decrease vulnerability to agricultural risks, and create better and more sustainable rural livelihoods.

The idea of a global food security initiative was first discussed in a G8 "plus" meeting in L'Aquila, Italy in July 2009, at which leaders pledged more than $20 billion for what became known as the Agriculture and Food Security Initiative. Leaders at the G20 summit in Pittsburgh in September 2009 then called on the World Bank Group to "work with interested donors and organizations to develop a multilateral trust fund to scale up agricultural assistance to low income countries." The African Union is working to promote African investment in comprehensive food security and adaptation programs through the New Partnership for Africa's Development and the Comprehensive Africa Agriculture Development Programme. Unprecedented cooperation between the Rome-based UN food agencies—WFP, Food and Agriculture Organization of the United Nations (FAO), and International Fund for Agricultural Development (IFAD)—included an agreement in 2009 on a Joint Secretariat to support the revitalized Committee on Food Security.

WFP's Strategic Plan also positions us to respond to hunger shocks in ways that support country-led food security and nutrition strategies. Understanding food insecurity and vulnerability is a challenging and crucial task, and "Vulnerability, Analysis, and Mapping" acts as a planning tool and an enabler to drive investment targeting appropriate and relevant hunger solutions where it is needed the most. Working with food security experts from academia, research institutions, nongovernment organizations (NGOs), and other partners, and drawing on years of operations in countries that continue to face the challenges of hunger, WFP works to understand household food consumption patterns, access to food, nutrition, food availability, food utilization, market analysis, and livelihood strategies. WFP enhances the ability of governments and partners to respond appropriately and ensure better access to food and nutrition while strengthening social protection systems and safety nets.

Multistakeholder investment in nutrition and access to food is urgently needed

Just 2 short years ago, a "perfect storm" of high food and fuel prices was spreading hunger, malnutrition, and misery across the continent. Today, we are transforming that perfect storm into a "perfect opportunity" to further align policies, programs, and resources behind national and regional priorities to help end hunger and promote increased access to nutritious food.

These efforts will succeed because they are country led and owned and we are taking a multistakeholder approach to address the challenges we face. Only plans led and owned by the people, governments, and the private sector can ensure real success and lay the foundation for sustainable food availability, access, and utilization.

These efforts will succeed because they are also collaborative—uniting the expertise of various stakeholders and building on programs that are already working. WFP has provided technical expertise in vulnerability analysis and hunger solutions and assisted in the elaboration of national hunger analyses and preparation of antihunger investment plans.

These efforts will succeed because they are comprehensive—addressing all aspects of food security. Increases in agricultural production alone do not solve the problem of malnutrition for the most vulnerable. The hungry cannot wait for food while we build perfect farming systems. There will be further natural disasters and continued volatility on global markets. Integration and strong coordination of the different programs and initiatives that build resilience and contribute to ending the cycle of poverty and hunger are needed.

Food and nutrition security is the backbone of functioning agricultural systems, just as functioning agricultural systems contribute to food and nutrition security. In many contexts, women are still burdened with most of the agricultural work on top of managing their families. And yet, the majority of them lack access to simple and relatively cheap agricultural tools.

The evidence is mounting that the situation is alarming and getting worse. Several recent reports underline the need for increasing efforts from WFP and the global community to jointly and urgently fight undernutrition especially in young children.

Extraordinary progress can be achieved in a short time when a state has both resources and political will to tackle hunger. For example, within 6 years, Brazil decreased child malnutrition by more than 70% through a combination of coordinated government programs and mechanisms, including cash transfers, maternal and child health strategies, and micronutrient distribution.

WFP also strives to leverage safety net programs such as school feeding, nutrition assistance, mother and child nutrition, asset creation schemes, and other cash-based interventions as contributors to the success and sustainability of agricultural development systems. WFP also implements activities that assist

food-insecure communities to ensure environmental protection, conservation, and reforestation, and promotes the rehabilitation of vital infrastructure. WFP is also strengthening livelihood and social protection systems through food-for-work and food-for-training activities that build capacity for agriculture productivity, thus contributing to enhanced food security among the most vulnerable.

We in WFP work with nations, companies, and investors to ensure that emerging interventions are deployed more effectively and efficiently to support the recovery of populations and economies. In 2009, WFP supported 21 million schoolchildren with school meals and 20 million people with food in exchange for asset creation such as improved community infrastructure to raise livelihoods and meet household food needs. WFP focuses on providing "the right food to the right people at the right time" so that we can generate maximum effectiveness and access to food, and nutritional impact for those we serve.

With these facts in mind, WFP has developed and continues to innovate its toolbox of proven hunger solutions that require continuous investment and support to better increase access to food security and nutrition interventions.

Connecting farmers to markets

WFP is leveraging its significant food purchases to connect farmers to markets through programs such as Purchase for Progress (P4P). The 5-year P4P pilot project, launched in September 2008, is assisting smallholder farmers by offering them opportunities to access agricultural markets and to become competitive players in the market place. This is a win–win situation because it allows the poorest to get the food they need, and it provides investment in developing countries. Since P4P's launch, WFP has contracted over 52,000 tons of food through P4P in 17 countries. About 600 farmers' organizations representing almost 760,000 farmers have been identified to be involved in P4P—so far, 100 of those farmers' organizations have sold food commodities to WFP. About 25,000 people have trained in skills, including organization management, farming techniques, quality control, and postharvest handling. In addition, 700 WFP and partner staff members trained and established working relationships specific to P4P with approximately 100 partners, including government ministries and other agencies, UN agencies, and local and international NGOs.

In Asia, P4P is implemented in Afghanistan and the Lao People's Democratic Republic; it is also implemented in African countries. P4P enables poor and smallholder farmers in rural areas, of which a majority are women, to benefit from a guaranteed sale at good prices to WFP while contributing to strengthened safety net programs.

The Bill & Melinda Gates Foundation, the Howard G. Buffett Foundation, and the Government of Belgium initially committed $76 million to this effort to transform the way WFP purchases food in developing countries. The initiative was announced during the United Nations General Assembly where progress

toward the Millennium Development Goals and the global food crisis are high on the agenda of world leaders. The Bill & Melinda Gates Foundation committed $66 million to fund pilot projects in 10 countries, and the Howard G. Buffett Foundation committed $9.1 million to 7 countries. Currently, P4P has received more than $137 million for technical capacity, including subgrants for 5 years from the European Commission; the governments of Belgium, Canada, Ireland, Luxembourg, and the United States; and the Kingdom of Saudi Arabia.

WFP's Executive Director has consistently asserted WFP's commitment to use its purchasing power to support the sustainable development of food security. That commitment stems from the fact that WFP has been a leading player in food markets in many countries for decades. Hence, WFP, in accordance with its new Strategic Plan for 2008–2011, seizes new opportunities to design its food assistance programs in a way that generates substantial demand for surplus food staples grown by small-scale farmers—and thereby reduces risks and improves incentives for investment in productivity-enhancing and income-increasing technologies and practices. Further, when procuring from developing country food markets, WFP's procurement procedures aim to avoid negative effects on those markets, including price rises that would harm the food security of the poor.

Investment in supply-chain solutions to address hunger

WFP's supply chain is a cohesive and high-performing business model, but it faces many challenges. WFP requires a massive network of resources, assets, and people. Yet, WFP recognizes that it cannot do this work alone, and that we must be continually innovating and adapting our supply chain in a world where there are no longer food surpluses. We need partners from the private sector to help us optimize our own supply chain in order to get food to the communities at the bottom of the pyramid. WFP also needs public–private partnerships to help support infrastructure development along complex delivery routes.

But supply-chain considerations go beyond the logistics. WFP believes that public–private partnerships can also be key in finding sustainable solutions to many other issues such as food quality and improving the value chain with nutritious food products. WFP is engaged in active partnerships with food and nutrition companies, applying the best minds in food technology and nutrition to help us tackle malnutrition in challenging environments. These partners also lend technological know-how in the development of new products and in areas such as packaging, milling, and food safety.

WFP aims to develop innovative public–private partnerships to strengthen its ability to respond to the increasing needs of the hungry poor. Companies specializing in logistics services, or businesses running large-scale distribution systems, help improve the efficiency of WFP through state-of-the-art commodity-tracking and other supply-chain methodologies and technologies. Companies that are in the business of food technology, nutrition, life sciences, and innovations

Box 1: Reaching people in need with the right kind of food

Public–private partnerships are a critical part of the ability of the World Food Programme (WFP) to reach as many people in need as possible with the right kind of food. WFP's approach to partnerships is matching the core needs of the agency with the core expertise of the private sector. WFP–private partnerships involve four critical components: core competency alignment; expertise and knowledge sharing; cash resources to feed people and to cover partnership implementation; and multiyear, multimillion dollar commitment.

WFP hosts the interagency partnership called REACH—ending child hunger and undernutrition. Established in 2008 by WFP, the World Health Organization (WHO), the United Nations Children's Fund (UNICEF), and the Food and Agriculture Organization of the United Nations (FAO), this program also includes civil society and the private sector. REACH promotes a holistic approach to addressing child undernutrition at the country level and places the needs of the child at the center of the intervention. The coalition coordinates all actors in a country working on child hunger and undernutrition to promote the most effective interventions.

REACH is currently pilot testing this approach in two countries—the Lao People's Democratic Republic and Mauritania. The approach has yielded excellent midterm results and has been awarded funding by the Bill & Melinda Gates Foundation and the European Commission's Humanitarian Aid & Civil Protection ECHO, which will allow it to expand to additional countries in the near future.

Source: Dipayan Bhattacharyya, World Food Programme.

to improve the quality of life through food can strengthen the type of food that WFP distributes. WFP offers a unique knowledge exchange opportunity where the developed world's most seasoned logisticians interact with WFP's own experts who present them with an entirely different and challenging world view (Box 1).

Scaling up investments and public–private partnerships to ensure access to nutrition

In 2009, WFP doubled the number of young children receiving nutritionally enhanced foods over 2008. In the same period, WFP increased by nearly eight-fold the number of under-2 children receiving new specialized food products (115,008 in 2009 compared to 15,000 in 2008).

WFP's ability to deliver the optimum food/nutrition balance has—until relatively recently—been limited to basic food commodities such as cereals, fortified cereal flours, oil (fortified with vitamins A and D), pulses, sugar, and iodized salt, alongside more specialized fortified blended foods such as corn soya blend (CSB).

WFP is further improving the quality of the fortified blended foods we provide by developing formulas for micronutrient powders for home fortification or point-

of-use fortification; exploring how to fortify staple foods such as rice; piloting the use of ready-to-use foods for preventing or treating moderate acute malnutrition; and exploring the option of complementary food supplements.

Undernutrition afflicts millions of children worldwide, permanently robbing many of them of a bright future. It affects a child's mental and physical development with lifelong consequences. It is preventable, yet it is getting worse. In the first 2 years of life, chronic malnutrition can mean reduced cognitive development, poorer school performance, and lower economic productivity and income-earning potential during adulthood. Young children, including those born with a relatively low birth weight, can make rapid gains later in childhood, but they may live with a high risk of chronic conditions, such as diabetes and cardiovascular disease.

The health care costs to treat such diseases as well as the losses to national economic prosperity are much higher than the sum needed to invest in preventing undernutrition in the first few years of life. Treatment of malnutrition is becoming easier—new food-based nutrition interventions have been developed, such as ready-to-use therapeutic foods for severe acute malnutrition. Growing interest in tackling child hunger is prompting the development of new food-based products to treat and prevent forms of undernutrition.

In addition to strengthening safety nets at the community level through these initiatives, WFP also aims at strengthening the capacity of national governments, partners, and local communities to develop, implement, and take control of their own strategies to end hunger.

Partnering with the private sector to invest in nutrition

Improving WFP's ability to deliver good nutrition has only been possible because of the support of the private sector .

Public–private partnerships with companies such as DSM, Unilever, the Global Alliance for Improved Nutrition (GAIN), and Kemin Industries, are absolutely essential to developing new and effective products. DSM is a global life sciences and materials sciences company. In April 2007, DSM and WFP joined forces to ensure the nutritional needs of WFP beneficiaries are met by creating cost-effective micronutrient interventions to improve the agency's general food basket.

Large companies such as Danone Group are interested in developing new business models to help curb hunger. Our partners have helped us develop products such as micronutrient powders, fortified date bars, and ready-to-use foods that do not need water (often a source of contamination). In 2007, the Bill & Melinda Gates Foundation awarded GAIN a $40-million grant to develop a sustainable public–private business model, with an aim of reaching at least 10 million at-risk children.

Another public–private partnership project that seeks to eradicate child malnutrition is Project Laser Beam (PLB). Initially focusing on Bangladesh and Indonesia, this 5-year, $50 million initiative will combat malnutrition through

projects and interventions in food, hygiene, and behavioral change and tools we may not be able to envision now. The project, which was launched in 2009, brings together the expertise of UN agencies (WFP, the United Nations Children's Fund [UNICEF], and the World Health Organization [WHO]) with Fortune 500 food companies and public–private partnerships, joined by others in the private sector, to harness the power of global, regional, and local business. WFP's founding PLB partners are Unilever, Kraft Foods, DSM, and GAIN.

PLB will employ the many nutritional solutions already available in the marketplace, ensuring they are accessible to those in need. When gaps in products and services are found, PLB will call on an ever-growing number of partners to step forward and develop new ones that can be scaled up and replicated as part of the fight against child hunger in other countries.

New and relatively new nutrition products

Ranging from pre-prepared, ready-to-use foods, such as peanut or chickpea pastes and fortified date bar snacks, to small compressed food bars with doses of vitamins and minerals, WFP has an ever-growing array of products that we can use to maximize the nutritional impact of our food interventions. Some of these products are already being used by WFP and our NGO partners.

WFP's country office in India has developed a ready-to-eat nutritious paste made from chickpeas, soybean oil, sugar, and dry skimmed milk powder, and fortified with vitamins and micronutrients. The ready-to-use foods (which do not need cooking or preparation) generally come in the form of a paste. They often come in portable containers and have a relatively long shelf life. Many have a peanut or chickpea base and research on other flavors is ongoing.

Compressed food bars are distributed to older children and adults when local food cannot be distributed or prepared. They can be eaten out of the package or as a porridge with water. Fortified high-energy biscuits are often used in the first days after an emergency when cooking facilities are scarce. WFP can tailor the formulation of high-energy biscuits to meet the needs of different countries.

Micronutrient powders, sometimes referred to by the brand name "Sprinkles" or "MixMe," come in foil sachets the size of a sugar packet. The powder is generally white and tasteless but is packed with essential vitamins and minerals. While micronutrient powders may differ in composition, a typical formulation includes iron, zinc, iodine, copper, selenium, and vitamins A, B1, B2, B3, B6, B12, C, D, E, K as well as folic acid. WFP is able to create different formulations for different populations, tailoring them to the needs of the people. The contents of the sachet are sprinkled on cooked food so that each serving contains the recommended daily intake of vitamins and minerals. A single-dose, 1-gram sachet of micronutrient powders costs just $0.027 or €0.02. Micronutrient powders are used in various types of programs to help prevent malnutrition, e.g., to complement school meals or WFP's general food rations. WFP is working with DSM to develop powders

suitable for use in many cultural contexts (including adding flavors) and in institutions such as schools.

Plumpy'Nut® is an energy and nutrient dense ready-to-use therapeutic food that is effective in treating severe acute malnutrition as well as in feeding people affected by chronic illnesses such as HIV and AIDS. It contains milk powder, peanut paste, vegetable oil, sugar, and a vitamin and mineral premix.

Plumpy'Doz®, is a ready-to-use supplementary food and is used in supplementary feeding programs, but taken in smaller quantities than a ready-to-use therapeutic food. A fortified peanut paste, Plumpy'Doz is meant for prevention or blanket distribution during highly food insecure periods and to prevent illness and promote overall growth and development. Ready-to-use supplementary foods are also used to treat moderate acute malnutrition. As supplementary feeding is generally WFP's responsibility, the use of these new ready-to-use supplementary foods is key to increasing the effectiveness of WFP's feeding efforts.

Supplementary Plumpy® has both curative and preventative properties for under-5 children with moderate acute malnutrition. Trials have demonstrated that when given a daily dose for 2 months, malnourished children recover quickly and are normally protected from malnourishment for a further 4 months. Each package contains 500 kilocalories in a peanut-based paste and is fortified with vitamins and minerals. It also crucially contains the right essential fatty acids appropriate for this age group.

Nutributter® is a food supplement intended to complement the diet of children aged 6–23 months and pregnant and lactating mothers. Using approximately 20 grams of the spread every day together with other foods should ensure that the nutritional needs of a child and mother are met. This product should be used for children whose diets are low in animal sources or fortified foods.

Fortified CSB (corn soya blend), also called CSB+, builds on a long-established WFP product that is now enhanced with vital micronutrients. CSB+ is used in WFP programs, reaching under-5 children, adolescents, and pregnant and lactating women. It may also form part of general food distributions, school feedings, HIV/AIDS programs, and other nutrition activities.

CSB++ is a new formulation of fortified blended food enhanced with essential micronutrients plus dried milk powder, sugar, a higher fat content, and reduced fiber and levels of antinutrients (substances that interfere with the body's use of nutrients). This product targets moderate malnutrition in children 6–23 months old by increasing the energy available in each ration while also making it more digestible and appetizing.

Despite an impressive array of nutritional products and services already on the market, there are gaps left to fill. Social investments and public–private partnerships with WFP can help expand the number of available nutritional products that, where possible, meet local taste preferences and use local ingredients. Nutritional solutions needed include services and technologies that facilitate the production

and distribution of high quality nutritional foods in developing countries whenever possible.

WFP needs experts in food quality systems and training. These include experts in food processing (especially complementary foods, maize meal, ready-to-use supplementary foods). Staff profiles include food technologists specialized in "dry products" (e.g., flours, baby foods, biscuits), food technologists specialized in quality management of complex chains, and machine technicians to troubleshoot. Also important to WFP are training packages on local food testing so this can be undertaken more quickly and efficiently (instead of using international lab contractors), as well as on equipment maintenance, food safety, and quality systems.

Additional opportunities for public–private partnership and policy recommendations

Awareness needs to be increased at the national level of the connection between chronic hunger and government expenditure on health and education as well as of the secondary effects on the labor force. For policy makers in the region, study and dialogue will result in increased understanding of the economic and social costs of chronic hunger and the costs and benefits of targeted policies to eradicate hunger.

Greater consensus and coordination among partners and stakeholders to address long-term chronic hunger through increased access to relevant data through a central database, vulnerability analysis, and innovative new approaches to analyzing food security, are crucial.

Effective partnerships will be an essential component of sustainability. Country-led and regional frameworks for cooperation are essential to help frame solutions within the region's long-term development goals and facilitate active partnerships with national government counterparts and the Asian private sector. Through consultation and capacity development, WFP will work closely with government partners to build strong government buy-in and provide convincing evidence of long-term savings associated with effective hunger eradication strategies.

Within the UN system, interagency partnerships with the United Nations Development Programme (UNDP), IFAD, the International Labour Organization (ILO), and FAO will ensure that the case about hunger is made and that long-term investments to improve access to nutrition are incorporated into national planning and government budgets in the medium to long term. WFP will make the case for the private sector to invest in product development, research, and WFP operations that ensure vulnerable areas are provided with sustained commitment and support.

Comprehensive and coordinated public and private sector investment in hunger solutions and nutrition can increase the effectiveness of aid in agriculture and food security.

The food and nutrition security nexus

Vitamin and mineral deficiency is the source of massive "hidden hunger" in Asia today. The deficiency underscores the importance of making the connection between food and nutrition security. Efforts are under way to link food and nutrition security together through food fortification and private sector involvement in treating malnutrition, especially of mothers and children. These are the key messages of the three presentations at the Investment Forum's brown bag seminar on food and nutrition security on 7 July 2010, sponsored by the Asian Development Bank's Agriculture, Rural Development, and Food Security Unit and Health Communities of Practice.

"Nutrition security measures people"

"Food security measures the commodity; nutrition security measures people." This was how Soekirman, founding director of the Indonesian Coalition for Food Fortification (KFI), summed up the nexus between food and nutrition security.

"A household achieves nutrition security when it has secure access to adequate food for a balanced diet, sanitary environment, adequate health services, and knowledge and skills to use accessible food," he said. "Nutrition security is more concerned with people's welfare—health, children's growth, mental and intellectual development, and productivity. It is more than just having enough supply and access to food; it is about the outcome of food consumption, indicated by nutrition status, especially of children."

Soekirman explained that all hungry people are food insecure. They experience a sense of hunger when they lack the basic food intake necessary for productive and active lives. But nutrition-insecure people are not hungry in this respect all the time. They may enjoy adequate consumption of food but still suffer from hidden hunger or micronutrient deficiencies. The most common deficiencies are iron, vitamin A, zinc, and iodine. This manifests itself in weight, height, and general physical problems among children and adults.

Lack of Vitamin A is associated with blindness and susceptibility to diseases such as diarrhea, measles, and malaria. Iron deficiency impairs cognitive development of children. Lack of iodine causes mental retardation and brain damage. Zinc deficiency contributes to growth failure and weakened immunity in young children.

Soekirman argued for a shift in paradigm. "The food and nutrition policy of countries should be made integral to national development and institutionalized by appropriate laws and regulations," he said. Food and nutrition policy should adopt a multisector approach, integrating food with other factors such as income, education, sanitation, health, and environment. Mandated fortification of salt, wheat, flour, cooking oil, and sugar is an example of this policy.

Food-based approaches such as food fortification have been recognized as the most effective way to address micronutrient deficiencies because some micronutrients are not always naturally present or available in foods people eat. Food fortification is the addition of nutrients to a food, such as Vitamin A or iron, to prevent or correct a demonstrated deficiency of one or more nutrients.

The discussants at the seminar also underscored the following:

- Greater participation of the private sector through investment in food fortification will help solve malnutrition. An enabling market environment is needed, which would include providing a food fortification logo (or national logo); technical standards; social education, marketing, and norms; and tax and tariff incentives for those who engage in fortification.
- Investment in nutrition interventions, particularly for mothers and children, should be given top priority. Nutritional programming can be the best development investment, especially if done during the window of opportunity, that is, between 9 months before and 24 months after delivery.
- Serious investment and greater private sector participation are necessary in partnering with governments and other agencies to tackle this crucial challenge.

In concluding the seminar, Jacques Jeugmans, Practice Leader (Health), Asian Development Bank, said: "At the end of the day, it is the person that counts, so nutrition is very important for food security. Investment in nutrition should be made in early childhood because this is the most critical stage."

Fighting the global burden of Vitamin A malnutrition

BASF–The Chemical Company offers nutritional ingredients for foods, beverages, dietary supplements, and the fortification of staple foods. BASF's Ralsiripong Tanachart noted that the company also produces nutritionally valuable, nature-identical carotenoids for coloring foods and beverages and provided the following information on the company's activities.

From Central America, Africa, the Middle East, and Central Asia to the Pacific Islands, BASF provides technical advice to local producers of fortified oil, sugar, flour, and milk. BASF is involved in many programs to help local producers of staple foods, the public sector, and civil society to combat the global burden of vitamin A malnutrition.

BASF is a leading global producer of vitamin A for human nutrition. For fortification of staple foods, BASF offers special vitamin A products that meet exceptional requirements in stability and efficacy even under extreme climatic conditions.

For sugar fortification, for example, BASF offers the powder Dry Vitamin A-Palmitate 250, which is highly suitable for sugar fortification. Its stability in bulk as well as in sugar is excellent because it is effectively protected by antioxidants. In addition, the fine particle size of BASF's vitamin A powder ensures a homogeneous distribution in sugar.

BASF has also developed a spot test kit to allow producers to check the concentration of the vitamin as it is being added. This mini laboratory, about the size of a laptop case, can be used to rule out under- or over-dosage, thus offering customers not only vitamin A but also a holistic solution package.

The vitamin A used to fortify oil, flour, and sugar is manufactured by BASF in Ludwigshafen, Germany. To allow it to be mixed with solid foods, it first has to be specially packaged at BASF's Ballerup site in Denmark, which specializes in microencapsulation of food ingredients.

Microencapsulation enables the addition of highly sensitive, predominantly fat-soluble nutrients to virtually all types of foods, beverages, and dietary supplements. BASF's nutrition ingredients business unit produces high-quality, microencapsulated carotenoid and vitamin powders, supplying customers from the food, beverage, pharmacological, and infant nutrition industries with carotenoids of beta-carotene, lycopene, and lutein; vitamins A, D3, E, K1, and B12; and omega-3 fatty acids.

BASF has more than 30 years of experience in product development and application and has subsidiaries in more than 80 countries.

Child health and the 7–11 strategy

World Vision International is a Christian relief, development, and advocacy organization dedicated to working with children, families, and communities to overcome poverty and injustice. Malnutrition is a critical problem in many of the countries where World Vision International works. Mariana Stephens, a nutrition adviser with World Vision, described their goals and operations.

Undernutrition kills more than 3 million children every year and prevents hundreds of millions from achieving their full potential. At the national level, undernutrition can reduce gross domestic product by as much as 6% a year. Globally, the direct cost of child undernutrition is estimated at $20 billion to

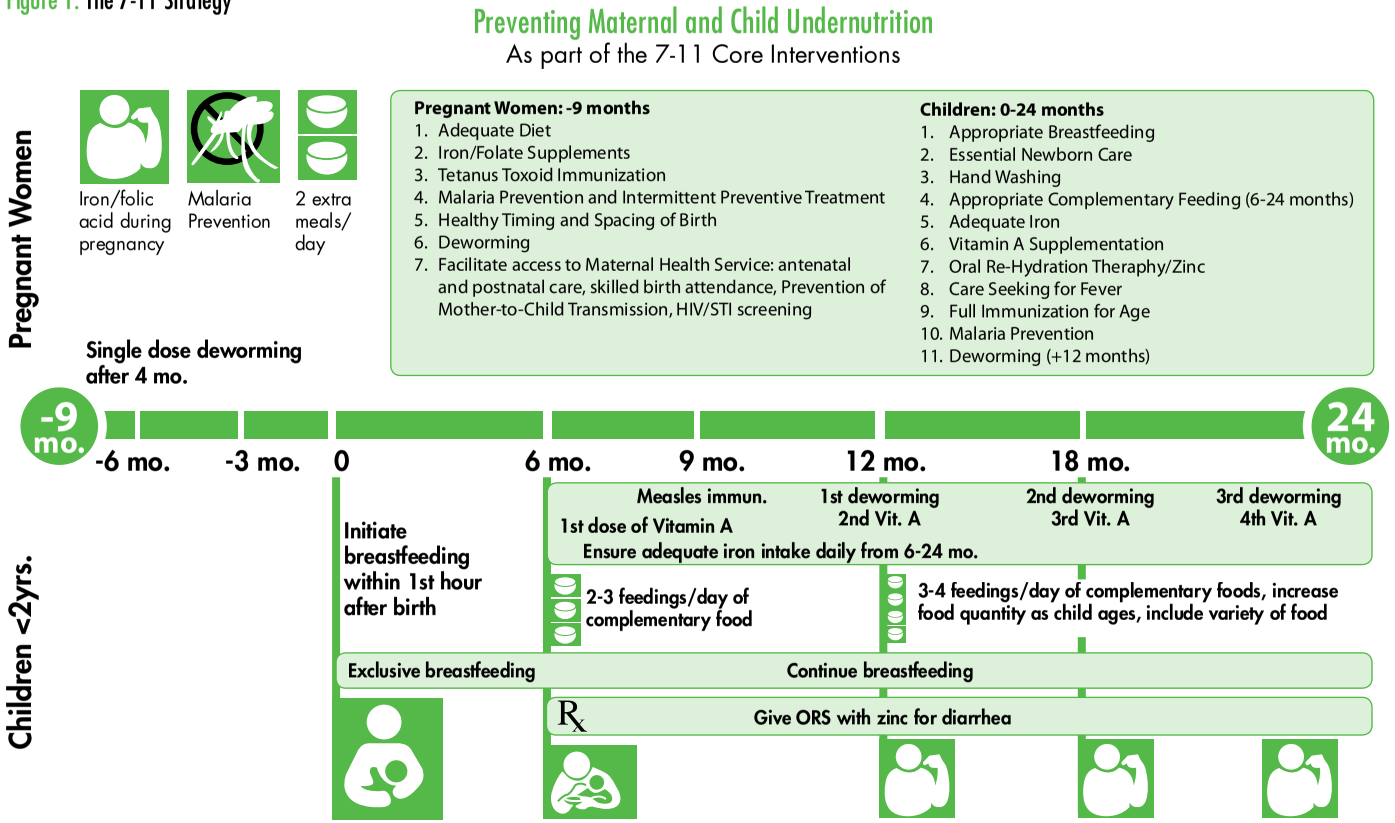
$30 billion. Investing in and improving the nutrition of children can accelerate economic development and poverty reduction.

Children are most vulnerable to long-term damage that results from undernutrition between conception and their second birthday. Children can also begin their path of undernourishment when they are still in the womb as a result of their mother's inadequate diet. Maternal undernutrition impairs the physical growth and brain development of the newborn baby and it contributes to the high number of low birth weight babies as well as to the high levels of maternal and child deaths. With this fact, the most critical periods of development for a child are 9 months before and 24 months following delivery, commonly noted as the "window of opportunity."

In November 2009, World Vision International launched its 5-year program, Child Health Now, based on the "7–11 Strategy" that addresses child hunger and undernutrition. This strategy emphasizes the importance of the "window of opportunity," with the number 7 standing for the seven core interventions for pregnant women and 11 denoting the 11 core interventions for children 0–24 months, all of which are research-proven interventions (Figure 1). These interventions are critical to improving the diets of pregnant women and young children. They are based on recent research findings that reflect the need for a comprehensive and integrated response to undernutrition.

Nutritional programming is the best development investment, but investments need to go further. It is time that we focus on multisector approaches to fund, design, implement, and evaluate programming that requires a long-term investment of time and resources and that is ultimately "country-owned" and built on the country's specific needs and capacities.

Figure 1: The 7-11 Strategy



Chapter 10

Perspectives from key stakeholders

"It is not enough that we recognize and talk about the challenges of food security; we need to take concrete action." (H. Konuma)

This 3-part chapter features the highlights of the panel discussions in Sessions 1 and 8 of the Investment Forum, involving major development partners and the private sector and how they have stepped up to the plate to fight global and regional hunger and poverty. The third part conveys the common position of civil society organizations that participated in the Investment Forum and registered the voices of the grassroots on the issues that affect them most.

The outlook of development partners

High on the agenda of the Investment Forum was the direct assistance of development partners to agricultural development and food security in Asia and the Pacific. Session 1 of the Investment Forum convened some of the major multilateral agencies, international financing institutions, government and intergovernment entities, and development agencies, whose representatives discussed their facilities and how they promote the replication and scaling up of innovative partnerships for sustainable food security.

Panel Discussants

Nikita Eriksen-Hamel, Member, Board of Directors, Global Donor Platform for Rural Development (GDPRD); Team Leader–Food Security Policy, Canadian International Development Agency (CIDA)

Patricia Haslach, Deputy Coordinator for Diplomacy of the Global Hunger and Food Security Initiative, United States (US) Department of State

Hiroyuki Konuma, Assistant Director-General and Regional Representative, Food and Agriculture Organization Regional Office for Asia and the Pacific (FAO–RAP)

John Lamb, Senior Agribusiness Specialist for the Agriculture and Rural Development Department, World Bank

Katsuji Matsunami, Advisor, Regional and Sustainable Deveopment Department, cum Practice Leader (Agriculture, Food Security, and Rural Development), Asian Development Bank (ADB)

Nick Taylor, Head of Development Cooperation, European Union (EU)

Ganesh Thapa, Regional Economist, Asia and the Pacific Division, International Fund for Agricultural Development (IFAD)

Tomochika Uyama, Minister, Economic Affairs, Embassy of Japan in the Philippines

Moderator: Xianbin Yao, Director General, Regional and Sustainable Development Department, ADB

Panel Discussion

Yao (ADB): What out-of-the-box and innovative programs have development partners pursued to address issues related to food security and sustainable agriculture development?

Taylor (EU): The EU is leading global discussions to promote a more coordinated and longer term international response to food security, particularly in the United Nations (UN), international financial institutions, and the Group of 8 (G8) and

Group of 20 (G20) to contribute to sustainable agriculture development and food security between 2010 and 2012. These commitments have been reconfirmed at the G20 in Pittsburgh and the G8 meeting in Canada. The European Commission has pledged $3.8 billion, or €3 billion, for that period in support of food security. These funds, which are additional to the pledges of member states, will be provided for our existing geographical and thematic instruments as well as the EU Food Facility.

We are on track to deliver on our pledges made in L'Aquila and through our multiannual programming processes. From the EU Food Facility, around €570 million of the €1 billion we allocated has already been disbursed in 2009 and the rest by 2010. Food security is also an integral part of the EU action plan to foster progress toward the Millennium Development Goals (MDGs) in view of the UN MDG high-level meeting in New York in September 2010. To this end, the EU supports the ambitious outcome document addressing the MDGs that are most off-track. At the regional level, the EU has most recently been involved in discussions with the Association of Southeast Asian Nations (ASEAN). At the 18th ASEAN–EU Ministerial Meeting, in Madrid on 26 May 2010, the ministers agreed to enhance cooperation on food and energy security between ASEAN and the EU. On the policy, strategy, and programming areas, in March 2009, a new EU policy framework for food security was adopted that puts food security and sustainable agriculture high on Europe's development agenda. The aim is to strengthen EU leadership in the global food security agenda and improve the effectiveness of EU assistance. At the same time, we have a new policy on humanitarian food assistance that seeks to ensure that all EU humanitarian actors operate within a common framework, analyzing emergency needs in the same way and designing responses that are appropriate to the needs and context.

In regard to the High Level Plenary Meeting of the General Assembly, we have developed a 12-point action plan in support of the MDGs that targets the most off-track MDGs and an inclusive package of measures and concrete proposals that form a very good basis for developing a strong EU action plan to support developing countries in reaching their MDGs. Priority attention will be given to the food-insecure countries most off-track in reaching MDG 1, which are often also fragile states. The policy has a comprehensive approach to addressing all four pillars of food security, which are

1. increasing the availability of food by supporting sustainable small-scale food production;
2. improving access to food by improving employment and income-earning opportunities complemented by social transfer mechanisms and safety nets, particularly for vulnerable groups including women;
3. improving nutritional adequacy of food while giving priority to pregnant and lactating women and children under 5 years of age; and
4. improving crisis prevention and management.

The focus will be to improve the resilience of small-scale farmers, including women and rural societies where agriculture forms the main economic activity. This means supporting systems that are sustainable and ecologically friendly through optimizing agriculture inputs, integrated pest management, soil and water management, and stress-resistant water management. This will be done within the context of value chains with adequate access to markets, finance, and processing techniques to reduce postharvest losses. The increase of food availability also implies more support for demand-driven public research and innovations. Last but not least, we recognize the important role of international trade to increase the quality and variety of food supplies.

With regard to instruments and funding, the EU, as mentioned, has committed $3.8 billion to the L'Aquila Food Security Initiative. In addition to this and in response to the acute food crisis of 2008, we set up the Food Facility with €1 billion, which is a complementary instrument to our other development finance instruments. The Food Facility supports the 50 developing countries worst affected by the food crisis across the world during the 3-year period of 2009–2011. The purpose of the facility is to respond to the effects on food security of the food price hikes in 2007–2008 through support for an agriculture supply-side response to the high prices and through social safety nets and other essential support mechanisms.

The primary objectives of the Food Facility are to (1) encourage food producers to increase supply, (2) respond rapidly and directly to mitigate the negative effects of volatile food prices on local populations, and (3) strengthen the productive capacities of the governments on the agriculture sector to enhance the sustainability of the interventions. The delivery channels have been chosen to provide a rapid reaction. This has resulted in 222 projects that have benefited 50 million people in poor countries. More than €570 million have already been disbursed and most of the money is already committed. This includes priority Asian countries such as Cambodia, the Lao People's Democratic Republic (Lao PDR), Myanmar, Pakistan, and the Philippines. In addition to the Food Facility, we provide continuous support to food security and agriculture.

At the global level, we support agricultural research for development extension and innovation and aim to increase such support by 50% from current levels by 2015. In addition, we support reforms on the committee on food security to become the pivotal global institution on food security in closer coordination with the Rome-based agencies. We recognize the importance at the regional level, which we believe is complementary and provides added value to country-level interventions by addressing policy and strategy development. For this reason, we are involved in policy dialogues with the Europe–Asia Meeting (ASEM) and ASEAN in support of regional interventions aimed at addressing food security and related challenges such as climate change, nutrition, price volatility, regional trade, social protection, food safety, research, and innovation on large-scale land acquisition. Within this context, we have a €20-million program with the United Nations Children's

Fund (UNICEF) on maternal and young child nutrition security in Asia and a €22-million project to be launched in 2010 to finance research and technology transfer projects related to food security in Asia. We also support components of the ASEAN integrated food security framework within the context of the L'Aquila Food Security Initiative.

At the country level, we provide funding for country-based long-term development programs, including country investment plans on agriculture and food security. With our partners, we are in dialogue on a policy environment for enabling increased investments in agriculture and food security, focusing on the poorest and most marginalized and fragile situations. This includes support to establish and operate targeted transfer mechanisms to manage the agriculture and food security risks faced by the poor and to improve their resilience.

Uyama (Japan): Like other development partners, agriculture has always been one of the important agendas for Japanese development assistance, especially in the context of Asia and the Pacific. I wish to discuss in particular the concept of Responsible Agriculture Investment (RAI). The RAI concept is being developed in various forums and Japan has organized several international meetings on this topic in close association with the four leading international agencies in this field—World Bank, Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), and the United Nations Conference on Trade and Development (UNCTAD)—as well as other partners such as the US Government, the African Union, and many others.

RAI was first proposed in the context of the growing trend of major agricultural investments, particularly those involving the acquisition of rights to land and related resources in developing countries. Under the concept of RAI, two competing challenges are meant to be reconciled where concerned parties are urged to maximize the benefits and minimize the risks associated with increased investments in agriculture. The first challenge is we must enhance investment in the agriculture of developing countries and achieve sustainable, inclusive, and pro-poor economic growth as well as rural prosperity. The second challenge is we must address problems associated particularly with large-scale land acquisitions. Poorly conceived laws and executed investments could have unintended negative impacts on the people of receiving countries. The overriding objective of RAI is to create a win–win–win situation for receiving countries, local communities, and investors.

Seven guiding principles have been proposed by the four agencies that address land rights, transparency, environmental sustainability, and other key issues. These principles, however, are subject to refinements based on the outcome of global and regional consultations. In addition to these principles, the World Bank and other agencies have conducted significant field research and unveiled an initial RAI knowledge exchange platform on the web so that available information is easier to find.

For our part, Japan has tried to play a catalytic role in promoting the RAI concept and framing a coordinated global response to the growing commercial pressure on land, water, and other productive resources across the developing world. Japan sees that this trend could have profound implications on the future of agriculture. As the world's largest food importer and a major donor in agriculture development, Japan is determined to continue supporting the four agencies and other partners working on RAI.

Haslach (US): Feed The Future is the US Government's global hunger and food security initiative that supports its $22-billion commitment made at the G8 Summit in L'Aquila in 2009. President Obama's pledge of at least $3.5 million to agriculture development and food security over 3 years will be deployed in a way that actualizes the Rome principles and accelerates progress toward the first MDGs. This forum is an exciting opportunity to work toward implementing these principles in Asia through country- and region-led processes. The five Rome principles guide our investments and our partnerships and we are very much committed to this. To recap briefly, the Rome principles are:

- First, invest in country-owned plans that support zone-space programs and partnerships so that assistance is tailored to the needs of individual countries through consultative processes and plans that are developed and led by country governments. We had a couple of excellent examples in this forum and I was most personally impressed with the presentation made by my friends from the Lao PDR, where I served as ambassador in the mid-2000s. It is very impressive to see the progress that has been made in the Lao PDR.
- Second, strengthen strategic coordination and mobilize and align the resources of the diverse partners and stakeholders, including the private sector and civil society, that are needed to achieve our common objectives.
- Third, ensure a comprehensive approach that accelerates inclusive agricultural-led growth and improves nutrition while also bridging humanitarian relief and sustainable development efforts. I think the real challenge for us in this room is combining agricultural production in ways that help to improve nutrition.
- Fourth, leverage the benefits of multilateral institutions so their priorities and approaches are aligned, investments are coordinated, and financial and technical assistance gaps are filled. While this sounds easy, it proves to be very difficult when you actually try to sit down and coordinate across different fiscal years, different planning cycles.
- Fifth, deliver on sustained and accountable commitments, phasing in investments to ensure returns, using benchmarks and targets to measure progress toward shared goals, and holding ourselves and other stakeholders culpably accountable for achieving results. We are very much committed to this. If in the process of monitoring and evaluating our programs, we find

that we are not being effective, we will do something out of the box, that is, shift our resources to more productive programs. We would like to commend ADB, IFAD, and FAO for leading this forum to create momentum for regional and country-led approaches to improving food security.

Our government's four priorities are, first, Feed the Future will focus its efforts on a group of countries in Asia where we will undertake analysis of key constraints to food security as well as make catalytic investments that are identified in country-owned plans. We view India as a strategic partner that can share its technical expertise with other countries while addressing its own food security issue. We would also like to applaud the success of the recent Bangladesh investment forum, in particular, the government's high-level commitment as represented by the attendance of the Prime Minister and several ministers from her cabinet. The forum concluded with a joint statement that expresses the government's commitment to developing a robust investment plan that has the full support of key stakeholders and ministries across the government.

Second, within the broader region, we will work with the leadership of institutions such as ASEAN and the Asia-Pacific Economic Cooperation (APEC). Through regional approaches, we will support the implementation of robust country and regionally owned food security plans as these institutions have long recognized regional integration through harmonized policies on food security. In June 2010, we helped to organize an ASEAN food security conference on the role of the private sector that successfully highlighted the need for innovative market-based solutions to food security.

Third, we have found that strong agriculture and nutrition working groups at the country level are essential for increased coordination and effective implementation. To be effective, these groups should include representatives from different ministries, such as agriculture, health, and finance, as well as donors, civil society, and the private sector. Broad consultation is essential but insufficient. There needs to be an effective mechanism at the country level to ensure that consultation and coordination are long term and meaningful and we really need to get behind this. Such working groups allow us to leverage our strengths and fill the gaps. For example, we intend to look for opportunities for investments to complement the infrastructure investments of ADB and the World Bank and to explore cofinancing projects with IFAD. Within country and regional approaches, it is especially important to bring together the health and agriculture sectors, so that our investments lead not only to improved incomes but to improved nutrition, the bottom line when it comes to hunger. Rather than solely focusing on medical models for treating undernutrition, we should also promote comprehensive approaches that emphasize dietary diversity and behavior change.

Fourth, we are promoting a multilateral approach through our investments in the global agriculture and food security program. The US has pledged $475 million to the multidonor trust fund that the G20 called for in Pittsburgh, subject to our congressional appropriations. Other donors, including Canada, the Republic of

Korea, Spain, and the Gates Foundation have also made strong commitments. The trust fund recently made grants of $224 million in support of country investment plans in several countries, including Bangladesh. So we think this is an exciting trust fund that supports the Rome principles and allows a range of donors to invest in sustainable food security. However, it will only make a dent in global poverty and hunger if more donors step up to this plate and if countries and development partners show real commitments to creating, refining, and implementing investment plans that are results-oriented and evidence-based.

Thapa (IFAD): IFAD basically has two instruments—loans and grants. And in the last few years, we have attempted to bring several innovative aspects to our programs.

First of all, we have attempted to bring greater focus to our investment programs and have identified two basic pillars to our investment activities. The first pillar is to focus on food production and productivity enhancement of smallholders, and the second pillar is to promote diversification of income-generating opportunities. We have also tried very hard to work with other development partners like the ADB, World Bank, and bilateral development partners so that we can build on the infrastructure support they provide while IFAD comes in with agriculture and rural development activities to achieve greater impact.

The second aspect to our innovation is working with civil society organizations, particularly the farmers' organizations. Every 2 years, we bring world farmer leaders to our governing council meeting in Rome so that they can interact with senior government officials and development partners in terms of what their priorities are. We have also tried to bring greater focus to our grant-funded activities and we are working with international partners like the Consultative Group on International Agricultural Research (CGIAR) to basically focus on enhancing the capacity of smallholders to adapt to emerging issues, such as climate change and risk and vulnerability issues.

To give you an example, we are working with the International Rice Research Institute (IRRI) to support the Consortium for Unfavorable Rice Environments. This is a consortium of 10 countries from South and Southeast Asia that develop improved varieties and management practices for four difficult environments—drought-prone areas, salt-affected areas, flood- and submergence-prone areas, and upland areas. Likewise, we are working with the International Potato Center to develop root and tuber crops because we want farmers to diversify their staple food production in view of the pressure on rice production alone. Similarly, we are working with FAO to strengthen the capacities of the ministries of agriculture in policy analysis and formulation for conditions of risk and vulnerability.

We have also given attention to analytical work so that it complements our investment work and grant work. For example, when the food crisis in 2007–2008 occurred, we undertook several research projects in collaboration with regional think tanks and universities to look at whether the soaring food prices were a

threat or an opportunity for smallholders and under what conditions, what was the supply response to changing food prices among smallholders, what was the transmission of world prices to domestic prices, and how can smallholders benefit from opportunities arising from the crisis. We think that all of these studies will eventually lead to knowledge sharing and south–south cooperation.

We have also been working with our partners in organizing events to enhance information sharing. For example, we collaborated with the Planning Commission of India and the ministries of rural development of "BRIC" countries, particularly Brazil and the People's Republic of China, and with South Africa in organizing an international conference on rural transformation in emerging economies so that there is some kind of sharing among developing countries. We are working with ADB, FAO, and others in promoting smallholder agriculture competitiveness in the Greater Mekong Subregion areas that we believe can serve as a model for other regional initiatives like ASEAN and the South Asian Association for Regional Cooperation (SAARC).

Konuma (FAO): At FAO, the fact that agriculture and food security are now at the top of the international agenda means it is already "out of the box." We generally feel that the financial crisis is over and we are moving toward recovery. But food prices are still 20%–30% higher than they were 3 years ago. We should remind ourselves that the problem is not in the short-term or emergency response but in the medium- and long-term period.

By 2050, we need to increase food production by 70% to meet the estimated increase in population to 9.1 billion. For developing countries, however, where already one-fifth of the people are suffering from chronic hunger, food production must increase by 100%. Statistics show that growth in cereal and rice production has averaged 0.8% per year in the 10 years from 1997 to 2007. Wheat production growth, on the other hand, averaged 0.2% per year in the same period. To meet the demand in the medium term or up to 2030, cereal production needs to grow by about 35%–40%, or an increase in production of 1.8% per year for the next 20 years or until 2050.

Considering existing conditions such as scarcity of water and competition for land for other crops, this will be a challenge. It is not enough that we recognize and talk about these challenges, we need to take concrete action. One of the greatest needs in this region is to synchronize policy formulation, strategy preparation, and investment planning. In the case of Bangladesh, FAO assisted the government in formulating a national food security policy. It is a comprehensive policy that involves the agriculture, fisheries, livestock, nutrition, and other sectors. Agriculture policy alone will not be sufficient; the approach must be comprehensive in order to tackle the food security issues.

Investment in agriculture is another important issue. To meet the demand of the growing population by 2050, FAO estimates that we need to invest $200 billion every year in agriculture and food security. For Asia and the Pacific alone,

the estimated investment requirement is $120 billion per year. At present, the level of investment in agriculture and food security is about $80 billion a year. This means we need to increase investments by 50% to meet the target. We need to be mindful, however, of the need to regularize investments, particularly investments involving land acquisition. As mentioned by Ambassador Oyuma, we have to establish international consensus and rules for responsible agricultural investments.

Another important area is supporting small-scale farmers who not only constitute the majority of the poor, but also the majority of the hungry. In this region, about 70%–80% of farmers are marginal farmers, and 80% of the world's farmers are in this region. Although our ultimate agenda for assistance may be different, we should all rally around the agenda to improve poverty alleviation and the nutritional state of the people. We all need to help poor farmers to produce more food in a sustainable manner and earn more income. At the same time, we also need to improve the capacity of small-scale farmers to contribute to the national and global food availability.

Matsunami (ADB): There are three elements to food security that we are discussing here. One is that Asia is home to the largest number of poor and malnourished people. Second, the world is becoming increasingly hungry. And third, agriculture has become big business. All these present opportunities and risks.

ADB has been asked many times if it is in or out of agriculture and food security. On the first day of the forum, President Kuroda declared that ADB is formally in the business of food security. ADB uses a multisector approach to food security. This means that ADB will make use of its core strength in multiple sector engagements such as infrastructure, finance, environment, education, regional cooperation, health, and agriculture. ADB may not be all over these sectors in any one of our member countries. We do selected and focused engagement whether that is in infrastructure, finance, or environment, with a clear view that ADB seeks core benefits to achieve food security.

But ADB alone doing selective focused engagement will not be effective, so we started talking about country partnerships. The concept is simple. For example, if ADB builds a road, other development partners like IFAD, EU, or the United States Agency for International Development (USAID) might come in with a complementary project, say on improving the investment climate. In that way, we are able to improve the synergy among partners and achieve higher impact.

ADB President Kurodaalso mentioned about partnerships at two levels—at the country level and at the regional level. We have also been hearing from different speakers that there are a lot of new concerns coming up particularly at the regional level because of trade, climate change, new agriculture research, biotechnology, and others. All these issues require collective actions. Essentially, what we are saying is that new problems need new approaches and novel partnerships. We have been

talking about partnerships for 30 years now and the question is what could be new and novel about these partnerships?

First, we have to bring in new players, obviously. It is no longer just about donor agencies and governments. We have to bring in partners who are willing to make huge investments and who are really outside the official development assistance community. Can we bring them in?

Second is about small-scale farmers. We should consider them as partners and not just as recipients of development assistance. We should build small-scale farmers' capacities so they can be active buyers and users of services and products, and active suppliers of the food the world needs.

Third is recognition of the political realities. When we bring in new partners, we have to realize that we all have different interests or goals. Despite our differences, we must come up with a set of common values that we can collectively hold to enable us to move forward together. Can we find these common values?

An idea might be to use these new partnerships as a platform for knowledge-based or science-based debate about some of the more current controversies, such as land acquisition by foreign investors and/or the issue of genetically modified organisms. These issues, whether we like it or not, have started shaping the rural landscape of Asia.

Finally, this novel partnership can be a platform for trying out innovative partnerships with the private sector.

Eriksen-Hamel (GDPRD): The GDPRD is not a bilateral or a multilateral development agency. It is an informal network of donors now comprising 34 members, including almost all the organizations represented in this panel. The members of the donor platform are united around a common vision that agricultural development plays an important role in poverty reduction with the particular focus on smallholder farmers, recognizing that they are the engine of economic growth in many countries.

The GDPRD has two broad goals. The first is advocacy—to provide coherent, evidence-based advocacy in support of increased and more effective aid in agricultural and rural development. Second is knowledge management—to improve knowledge sharing among its members. The aid effectiveness agenda is central to the platform's work and seeks to achieve this by enhancing the capacity of members to deliver more effective agriculture and rural development programming.

The GDPRD as a marketplace of information provides an opportunity for members to bring knowledge and to take away information. And, as its name implies, it is an effective platform for coordination. It fosters and facilitates collaboration among development partners mostly at the global level, but also at the regional level and occasionally at the country level.

This year, the donor platform has four working groups. The first is on global governance and aid effectiveness. The second is the Comprehensive Africa

Agriculture Development Program, which has a regional focus that has shown tremendous success in coordinating donor response to national agriculture investment plans in Africa. The third group is on agriculture and climate change, and this group has been active in advocating for increased recognition of agriculture in the global climate change dialogue. And the fourth is on land acquisition and land investments, a topic of particular interest in the Asian region.

In Asia, the GDPRD has worked on the country level. For example, in Cambodia, the donor platform supported the government and the donor community toward harmonization and alignment in the land sector, including drafting a white paper. In Viet Nam, the GDPRD is involved in an assessment of a donor–government coordination group. The GDPRD has supported important civil society consultations in Afghanistan, Bangladesh, Cambodia, Nepal, and Viet Nam and worked on strategic initiatives with key agencies. For its future work, the donor platform would like to better integrate regional networks into its overall work.

In summary, the GDPRD adds significant value to food security programming in four ways:

1. it is a knowledge bank of lessons learned and best practices in agriculture and rural development,
2. it leverages other agency knowledge in the development of common aid effectiveness tools,
3. it allows for mutual accountability of international commitments, and
4. it builds strategic partnerships among all development partners.

On this note, I reach out to all donor platform members that have strengths in the Asia and Pacific region, such as Australia and ADB, to take a lead role in sharing knowledge and best practices in topical issues relevant to the region, such as climate change, land investments, and engaging the private sector. Similarly, the GDPRD's work particularly in Asia would greatly benefit from stronger ties with Japan. I would also like to mention that within my agency at CIDA, the activities and coordination work of the donor platform are very helpful. The products and reports published by the GDPRD are very useful to our work and I encourage everyone to visit our website.

Lamb (World Bank): It is evident from the preceding speakers that we share decades of working as partners and are engaged actively in trying to develop innovations to respond to changing circumstances. I do not think any of us can remember a time when there was this level of interest in agriculture and food security, this degree of collaboration among development partners in a sincere desire to seek convergence in policies and approaches. So I think there is already quite a lot of innovation on top of the long-standing partnerships. We all start from a shared commitment to the MDGs.

As far as the World Bank is concerned, we decided first to do a *World Development Report* on rural development in 2003 and 2004, and more recently

in 2008 a *World Development Report* on agriculture to remind ourselves of how important agriculture is to generate rural prosperity and alleviate poverty and hunger, particularly among farmers and rural consumers. With that in mind, the World Bank is trying to increase its investments in agriculture to match our rhetoric and to cope with the increasing demands of the financial crisis globally.

In 2010, the World Bank committed a total of $72 billion in resources, which is significantly up from the prior year, which was $59 billion. Not too long ago, we were just in the range of $15 billion to $20 billion. So over the last several years, the World Bank Group has raised its total available resources tremendously to a level that, frankly, is not sustainable over the long run unless there is continued support from the member countries as well as complementary investments on the part of single governments and the private sector. Within the East Asia region and for the fiscal years 2009 and 2010, the level is approximately $9 billion so it is a significant chunk but not a predominant share of the $72 billion.

We, as all of you, are concentrating on Africa to a large degree and a lot of resources are headed in that direction. In response to the spiraling food prices, the global food price response program was set up with an initial $1 billion in 2008 and then extended to $2 billion. It was an innovation in itself in that only a week was given to the World Bank's Board of Directors to approve the proposed funding request. That was a major change in the way the World Bank operates in response to the crisis. More recently and out of the L'Aquila process, we took responsibility for setting up one part of the response, which was the Global Agriculture and Food Security Program. It is now operating and receiving major investments from the US and from other major donors, but is still not up to the total level we all want. The program has already started to make major grants at the country level in support of country-led processes as discussed here.

Everything that we are doing in the World Bank in agriculture tries to be consistent with our agricultural action plan, which has five major components. We concentrate on (1) agricultural productivity and competitiveness; (2) linking smallholders and producers in general to markets and value-chain development; (3) reducing risk and vulnerabilities; (4) improving agriculture entry and exit in rural nonfarm enterprise; and (5) environmental services, in both reducing the footprint of agriculture and improving the awareness and valuing of environmental services such as soil conservation work.

So, what is new that is affecting our decisions right now and what are the unsolved challenges? Obviously, we are all facing a situation of incredible uncertainty and volatility in prices, which translates into risks. We are all facing the impacts of climate change and the need to effect climate change adaptation. We are all reacting to changing demographics of the shifting locus of economic geography. We are all considering how to deal with new players, an issue brought up earlier that I think is quite important and something we need to talk about these days.

There are new major financial players coming on board, and a resurgence of interest in farmlands and international agriculture. Major investment players,

pension funds of huge size that in recent times had not even considered investing in developing and emerging countries, are now marshalling huge amounts of resources and are showing sincere interest. How do we work with them? How do we incorporate them into our development strategies and plans?

We are facing new involvement on the part of governments. This resurgence in interest in international agriculture investments involves direct actions, sometimes by governments or government-linked corporations, which is a new phenomenon. We are seeing increasing involvement of life sciences firms and pharmaceutical companies that were not in the past directly involved in agricultural programming but are now getting interested in it. We have to find a way to deal with these major sets of actors in an innovative and productive manner.

We are also seeing a change in attitudes. We are seeing a much greater sense of responsibility, which is a positive phenomenon. The World Bank is being visited routinely now by chief executive officers of major agribusiness firms and major firms in other sectors that in the past would not even come to talk to us. We are reaching out to them and they are reaching out to us. But, how exactly do we at the World Bank and other partners connect with individual private firms of global reach? How we connect with the associations they are working with is a challenge that is going to require innovation when we are charged with looking out for the public good while recognizing the value of private initiative.

We are facing challenges internally as well. The emerging recognition of the nexus between food security, agriculture, food safety, and nutrition, which we are seeing in this room today and will continue to see, is a very new phenomenon. In the international agencies, I know we all have trouble dealing with this. Within the World Bank, our health units and agriculture units do not talk easily to each other yet we have to in order to deal with the issue and in recognition of the connections. We are also challenged with how to deal more effectively within the various World Bank units—the relationship between the International Finance Corporation, which used to call itself the private sector arm of the World Bank, and us, which we call the public sector arm. That is no longer the case, we both work with both the public and private sectors, so how do we work together? That is going to require innovation.

We face major challenges, such as those mentioned by our colleagues from Japan, FAO, and IFAD, on how to deal with the resurgence of interest in international agriculture in a responsible manner that respects rights and resources, that respects the difficulties of displaced persons and tries to prevent displacement, that acts in a transparent and fair manner, but that also channels in a productive manner this huge new interest in investing in agriculture, in farmlands, throughout the world. How do we use that in order to not just continue to increase agriculture production but to reduce the yield gap in developing countries compared to developed countries?

In all of these areas, we will have to continue to build on existing partnerships and find new ways to work together among the agencies here present, between

these agencies and the NGO community, and between all of us and major private sector players that now have major global interests as well as increasing engagement in agriculture.

Open Forum

Question: In the process of thinking outside the box, are development partners now working directly with the private sector? Are there opportunities for partnerships with NGOs?

Thapa (IFAD): Definitely, if we consider farmers as a private sector. We also work very closely with civil society and NGOs. While we cannot generally give grants to the commercial private sector, our new grant policy has opened a new window of being able to give grants to them but subject to approval by our executive board. There are some restrictions on whether the grant given to the private sector actually helps the poorest of the poor. That is the due diligence that we would like to have.

Through our grant funding mechanism, we have worked with private foundations, like the Tata Foundation in India, and private sector companies in collaboration with research institutions and government agencies to pilot some of the innovative aspects of value-chain financing. IFAD now has a debt sustainability framework in which developing countries fall under three categories. Some countries get 100% of IFAD resources as grants and some countries get 50% grant and 50% loan, while others get 100% loans. We probably have created leverage to work with countries that get 100% grant to also invite the private sector as a responsible partner.

Taylor (EU): The Food Facility of the EU has a large amount of funding for international organizations and for governments as well as NGOs. The amount in contribution agreements with international organizations is approximately €627 million, the budget support about €136.5 million, and grant agreements with NGOs are about €218 million.

The strength of the approach is that the problems vary according to the communities we are working with. I think this is really very important and we have not had time to discuss it in this session. In the case of the Philippines, for example, we have three significant programs with international organizations under the food facility. Two of them, one with IFAD and one with FAO, address supply-side issues—the basic seeds, fertilizer, and irrigation type inputs. The other, with the World Food Programme, addresses the issues associated with social protection of the poorest of the poor. We have programs with NGOs and they are incredibly varied.

The point is this: if you encourage poor farmers to use improved or certified seeds, you are encouraging them to take risks and we all know that the poorest

of the poor are extremely risk-averse. For instance, in the Philippines, there are communities living in areas that will not benefit from adaptations from rainfed agriculture and/or small-scale irrigation because you immediately have enormous problems about who is going to buy the products and who is going to own the equipment as simple as, say, pumps. The great advantage of working with NGOs is that they can address the needs of those whose circumstances will not benefit from that. Every community needs a different solution and that is an important thing to realize.

Haslach (US): Funds are available for civil society, for NGOs, for governments, and they are going to flow in many different ways. I would also like to point out that there are funds available for the private sector. The Global Agriculture and Food Security Program trust fund being managed by the World Bank actually has a private sector window and they are in the process of setting up how that window will operate.

Question: Is there convergence of issues on food security?

Konuma (FAO): When we talk about food security, people tend to think about agriculture and food production. But the reality is different. Food security covers three dimensions: supply of food; access to food; and utilization, including nutrition education. So, it is clear that food security cannot be achieved by production alone. We need to combine efforts to include increasing incomes; improving nutritional status; and combining farm with nonfarm activities, including irrigation and primary health care. Combining all efforts will lead to the attainment of food security.

Question: It seems that the only missing element in the food security initiatives is the sense of urgency?

Haslach (US): I have to disagree that there is no sense of urgency. I have worked in agriculture-related development assistance programs since the late 1980s and I have never seen urgency like this and have never seen money committed, at least by the US government, in such a way for many years. We are moving pretty quickly in that direction.

Lamb (World Bank): I agree with Ambassador Haslach. The Global Food Crisis Response Program had money out the door faster than any other World Bank project in history, and was benefiting, within the first year, a million farmers directly with seeds, fertilizers, and other inputs. This took the edge off the increase in prices and the drop in agricultural credit that occurred surrounding the food price crisis and later the financial crisis. The same thing is happening now in the

Global Agriculture and Food Security Program. Commitments are coming in very fast, and commitments are going out fast as well.

Another major program of urgency is the response to what some, not so affectionately, call the "land grab," and we are under great pressure to come out with a pronouncement of whether this is a good thing or a bad thing, and what governments should do about it. The pronouncement took longer coming and is still now taking the form of principles, and evolving rapidly from this point to voluntary guidelines and other directions. The tension is between the sense of urgency and the sense of taking action or coming up with broad directions and agreements that share a consensus among international agencies and that have a strong backing of civil society. To the extent we move fast, we always run the danger of losing or not incorporating the inputs from all sectors of stakeholders of importance. And this has been a continuing tension in the collective response and responsible agro-investment.

Question: How can accountability be promoted among partners in supporting food security?

Haslach (US): On the issue of results frameworks and monitoring and evaluation, we will be looking to the donor and/or agriculture working groups within specific countries where we will be providing the assistance working with the governments. We will be looking as well to the recipients to show us the results. If the results are not there, and based on a number of different factors, we will decide to reallocate our resources to places where we are getting results.

Eriksen-Hamel (GDPRD): On the question of accountability, there is a group called the L'Aquila Food Security Initiative that emerged from the 2009 G8 Summit. This group works in close collaboration with the G8 accountability working group in a transparent manner to clearly articulate the parameters of the L'Aquila commitment. Given that accountability was a priority of the 2010 G8, I can assure you that, moving forward, accountability commitments are going to be a big priority for the G8 and for my country, Canada.

Question: What are development partners addressing with regard to climate change?

Lamb (World Bank): Since the World Bank was not a leading player initially in the climate change dialogue, we participated in and followed what the Intergovernmental Panel on Climate Change and some other UN agencies were doing who were most on top of the topic. When requested, however, the World Bank has ratcheted up its involvement in the climate change arena and did play a role in bringing agriculture to the fore in the Copenhagen discussions. We have

also been working internally, not so much on mitigation but on responses and sense of adaptation.

At the regional level, there have been a variety of analytical papers on (1) what are the options for climate change adaptation given the best available information, even if it is uncertain; and (2) what are the guides we can give to client governments on how they might consider different options, and then analyze the possible costs and benefits of the options (in the face of uncertainties about really what is going to happen). We have been doing analytical and advisory work on climate change and we are getting ready to mainstream the work into programs as the information becomes available and the situation becomes clearer.

Question: There is increasing nexus between hunger; nutrition; income inequality; and, more explicitly, conflict. Is there anything being done to address conflict?

Lamb (World Bank): Climate change and issues, such as responsible agro-investment and land governance, obviously interconnect with the issue of conflict. We are quite concerned with displaced persons, respect for indigenous peoples, and respect for existing rights and resources, and in everything we are doing in responsible agro-investment and analytical work. Within the next month or so, a 21-country study of what actually has been happening in terms of commercial pressure on land will be issued. We are quite conscious of issues relating to conflicts that have arisen or could arise and have been very proactively engaging the units of the World Bank that are involved in social protection and other themes such as these to understand their perspective on what is happening and what they can recommend to be done about these issues.

So, I think climate change, the land grab response, and other issues are all interconnected. To the extent possible, all of the agencies present here are trying to treat them holistically from a multisector point of view.

The private sector perspective

Developing Asia hosts a vibrant food and agriculture industry that, over the years, has produced some of the most dynamic agribusiness and food companies. Session 8, organized by ADB, in the Investment Forum gathered chief executive officers and senior management of home-grown companies that have built global and domestic businesses by integrating local industries, communities, and small-scale producers in supply and value chains. The following includes the highlights of the panel discussion on the private sector's involvement in food security efforts and the nature and level of partnerships and enabling environments they seek for further growth.

Panel Discussants

Sanjeev Asthana, Founder and Director, I-Farm Venture Advisors Pvt. Ltd. and former Chief Executive Officer (CEO) of Reliance Retail Ltd. (India)

Ysmael Baysa, Vice President for Corporate Finance and Chief Financial Officer, Jollibee Foods Corporation (Philippines)

Vivek Bharati, Executive Director, Agriculture and External Affairs, PepsiCo India Holdings Pvt. Ltd. (India)

Rudyan Kopot, Chairman, Permanent Committee on Aquaculture Industries, Indonesia Chamber of Commerce (Indonesia)

Margaret Malua, President, Samoa Women in Business Development, Inc. (Pacific Subregion)

Ranjit Page, CEO, Cargills Ceylon PLC (Sri Lanka)

Heramba Rajbhandary, Founder and Executive Chairman, Nepal Dairy Pvt. Ltd. (Nepal)

Soman Padmanathan, Jain Irrigation Systems Ltd. (India)

Moderator: Rajat Nag, Managing Director General, Asian Development Bank (ADB)

Panel Discussion

Nag (ADB): What should Asia and the Pacific do to address the challenge of how to feed the additional 3 billion people who will inhabit this planet in the next 40–50 years, including the 1 billion who presently do not have enough food? What is the role of the public sector and what actions should the private sector take to secure food for all?

Asthana (India): Governments will always have a critical role to play in agriculture and food supply and this role has become all the more important in recent times with the spiraling of food prices. An important area for government intervention is creating the enabling environment for a more efficient distribution of agriculture

and food products and there are successful examples where governments have kept food inflation in check. Government actions in the past have included such measures as controls on trade, commodity flows, and cost of storage.

The private sector, on the other hand, can play an important role in food security by creating the needed infrastructure and distribution mechanisms, enabling market discovery through futures exchange, and establishing efficient retail channels. I believe the government and private sector work hand in hand extremely well, and public sector policies and private sector actions can be aligned in these various areas. A most welcome outcome of this forum is the opportunity for other players, such as multilateral institutions and community service organizations, to come together with the governments and private sector to discuss how to align their policies to ensure that food prices remain in check and food is more efficiently distributed.

Bharati (India): The Indian government has and will always be an ally of the private sector. In the case of Pepsico, we actually began our operations in India in partnership with the government, through a joint venture in 1989–1990 with the Punjab Agro Industries Corporation and Punjab Agriculture University. Even now, Pepsico collaborates with a number of public agencies. I think the issue is not public versus private. Agriculture is a complex sector and to change it and bring it forward will always require public–private partnership.

If you look at the Green Revolution, for example, it was the biggest contract farming program that the Indian government launched. The government created knowledge through government-funded laboratories, assured they would buy the grains on a timely basis, and bought the grains, which mitigated the farmers' risk, and that's how the supply chain worked.

Let me give you two examples of our own interventions where similar models worked regarding what the government tried in the Green Revolution. We began with tomato in partnership with Punjab Agricultural University. At that time, the total availability of tomato in Punjab was 20,000 tons. We needed 35,000 tons for ourselves. We evaluated 222 varieties and introduced the right variety. The yields jumped 3.5 times and within a few years, tomato production in Punjab went up to 200,000 tons. Prices dropped, yet incomes increased. It was a win–win for everybody and we, as a processor, got the right amount of input.

Today, we are doing similar work in potato. We work with around 15,000 potato farmers and 10,000 other farmers, perhaps the biggest contract farming program in the country. And what have we contributed to food security? We developed new knowledge and new tools, sometimes in partnership with public agencies. We disseminate that knowledge to the farmers through better agronomic practice. We reduce farmers' risk, create alternative markets, reduce postharvest losses, create infrastructure, and enhance productivity yields.

We also introduce cost efficiency and, with productivity yields and risk mitigation, this results in revenue maximization for the farmers. We consume,

thus providing sustained income for the farmer. We enhance the capacity of the farmer to manage other crops better and we promote sustainable farming. Our latest thrust in sustainable farming is reducing water consumption in potato and rice and reducing methane emissions from rice cultivation.

These are the things that we contribute and we all do these through partnerships. We work with public agriculture knowledge centers and we partner with state governments.

Baysa (Philippines): One of the things that Jollibee is doing right now is partnering with local governments. Philippine agriculture, as you know, is not very well developed and not very well organized. As a result, we have difficulties sourcing enough volume for our company's needs. To address this problem, Jollibee launched a program where we work directly with selected farmers and local governments. The concept of the program is for local governments to organize the farmers to bring their produce to a common location.

We also work with local governments to encourage farming by providing farmers with new technology and/or information on new products. This has been very successful for us. Right now, local farmers are supplying about 15% of our vegetable needs and we would like to increase this to 50% as soon as possible. It works for us because we get the products fresh and in the right quality and, frankly, at a lower cost. The farmers in turn learn technology, are assured of volume demand, and they get a higher price for their produce. They are actually making more money now.

Malua (Pacific Subregion): From the experience of the Pacific islands, there is an advantage to being small. It enables us to easily coordinate and integrate small-scale farmers in the rural areas by promoting traditional systems and traditional crops, and at the same time looking for markets. We work throughout the value chain in a coordinated approach and we promote income-generating opportunities. We then integrate small-scale farmers into the formal sector, through capacity building and nurturing. We provide them with farm technologies and facilities, and then link them with a market, including access to international markets. For example, even though we cannot compete with Asia in terms of coconut oil, we have found a niche in the United Kingdom for our pure virgin coconut oil.

Having said that, let me stress the importance of building partnerships with the government, and especially the need for having a champion. In our case, the Prime Minister himself is championing the promotion of traditional systems because it is the only way we can create a niche in terms of exports and providing more opportunities. Access to finance is a major constraint because of the smallness of the market and because there is a lack of collateral where 80% of the land is customarily owned. We facilitate access to finance through our small business loan guarantee scheme that we are implementing with the banks.

We also create partnerships within the private sector wherein micro, small, and medium enterprises link up with the big businesses through the chambers of commerce. We formed one national private sector organization so we can have one voice. We work with the government in providing the enabling environment where the infrastructure, the way of doing business, the cost of doing business, and everything related to business is assigned to one position.

Page (Sri Lanka): Just a brief background on our company. Cargills Sri Lanka is not related to the US company. We are 30 years older, having been in Sri Lanka for more than 160 years. Our company used to be focused on serving just the urban areas. However, in 1999, I had the opportunity to meet with smallholder farmers about their needs—in terms of water, fertilizer, finance, and the marketplace. After these meetings, we started asking how Cargills can best meet these needs and serve the rural population. So, from 1999 on, we changed our mission and incorporated into it a responsibility to meet and serve the needs of smallholder farmers and people in the rural areas.

There were three issues that people in our country were facing then. One was the high cost of food. In 1999, 60% of a family's income was spent on food. The second was youth unemployment. The farmers' children did not want to take up farming and neither did they want to do work they felt was beyond them, so they went overseas. But they were doing exactly the same job they had refused to do in Sri Lanka, though earning more. The third issue is regional disparity.

By focusing on specific smallholder needs and delivering the company's services to them, we were able to bring down the cost of living purely through waste reduction. Case studies on our website show how we brought the wastage down from 40% to 5%. The second thing we did was provide skills development and training in agriculture, food handling, and the supply chain. By doing these things, we were able to get the government and the state to recognize us as a vehicle to deliver the needs of the people, especially related to food. While our company operates to make profits, we have done things differently so that we are able to more effectively partner with the government in ensuring food security in our country.

Rajbhandary (Nepal): When Nepal Dairy started, the government believed in state-owned enterprises. The government had a monopoly of businesses. Since the government was not very encouraging and was even antagonistic, we worked on small-scale dairy. We started with selling yoghurt. I started the company after retiring from government. Since 1990, the government has realized the importance of the private sector and, gradually, private sector participation in business became more appreciated.

Today, our government appreciates the partnership with the private sector in achieving things. Our company was the first private dairy. We started with limited capital but we were determined to succeed. By 1995, there were already

200 private sector dairies, supplying 60% of the dairy market with the remaining 40% share being served by the government. We in the private sector are supporting the government programs for food security because we have had lot of experience. There are ways to work together with the government, others from the private sector, smallholders, and donor agencies in this area.

Kopot (Indonesia): One of Indonesia's success stories in agriculture is in palm oil development. About 20 years ago, the total area for palm oil was just about 500,000 hectares. Today, the total area planted to palm oil is 7.3 million hectares. Production increased from only 700,000 tons to 22 million tons today, the largest production in the world.

What has been the role of the private sector in this agribusiness undertaking? First, the private sector enabled the acceleration of production. In Indonesia, the big companies are engaged in the production of just two crops: palm oil and sugar. Because of private sector involvement, Indonesia now imports less sugar and if more private sector players continue to come, we will no longer be an importer but an exporter of sugar.

The palm oil sector provides a model in cooperation. By law, a private company obtaining a license for palm oil production has to share 20% of the area with the smallholders. This is called the nucleus estate smallholders' scheme. This is why in the palm oil industry, 52% are corporations, 42% are smallholders, and the rest are state-owned enterprises.

From our experience in the palm oil industry, the role of the private sector is important in agriculture investment and in accelerating production capacities. The private sector also plays a key role in research and development as can be seen from the experience of Indonesia in palm oil. If you do not have funds for research and development then nobody will do it because even the government has a limited budget. To reduce food insecurity, these kinds of partnerships should be fostered.

Nag (ADB): How does the private sector work with policy makers to address politically sensitive issues such as water pricing and rural infrastructure?

Padmanabhan (India): There is evidently a lot of water wastage occurring in the world. Our interest as a private company is to have water-saving micro-irrigation technologies adopted by the greatest number of farmers. We are an input supplier company and, from our perspective, water should be charged. It is probably not politically correct to say water should be charged, especially in India where 178 million of the farmers are smallholders. But, telling somebody that water saving is important for the future is not possible now because water is free.

The other part of your question is on public–private partnership. What do the private partners do? First, there should be some acceptance that the private sector's primary interest is to do business and to make a profit, otherwise, there would be no private business in the world. After that, we can now focus on what

private sector does not only with government but also with other national as well as international institutions.

Take the case of our company. When we bring the micro-irrigation technology to the farmers, we are not just selling the products. We have to create crop-specific technology packages that go with the products, which we have done tremendously well in India and the government is supporting this very liberally. However, it is not always clear to the farmers that our interest is not only in selling the products but in increasing the yield of their farms just by using the system we have developed. It is here where the private sector needs real involvement of institutions like universities that have to see through the research work. Each crop-specific technology, which includes the micro-irrigation component, would bring water security, and water security leads to food security as well.

Bharati (India): Water is perhaps the most important issue that could affect food security. In India, agriculture consumes about 83%–84% of water, domestic use is 10%, and industry, 5%–6%. If we do not address the issue of water conservation in agriculture, within 10–15 years we will be facing a scenario where a lot of aquifers will vanish because water is being plundered.

At present, water has no cost, no rational pricing, which does not reflect its scarcity. Water, in the same manner as power, needs to be priced. Otherwise, we are going to face a huge dip in agriculture production. In the industry sector of India, Pepsico takes an active role in confronting the water issue. Pepsico prepares policy papers and we have already made presentations to the government highlighting the gravity of the situation as far as water consumption in agriculture is concerned.

Pepsico is undertaking two major initiatives. We are promoting direct seeding of rice cultivation and doing away with nursery and transplanting, and flooding of ricefields. This year, we are going to do direct seeding of more than 4,000 hectares (10,000 acres). We have developed our own seeds, which are given free to the farmers who adopt this method. We estimate that if 50% of India's rice production goes to direct seeding, it will save as much water as what the entire Indian industry consumes. The second thing we are doing is we are now promoting drip irrigation in potato production and giving high prices to the farmers who install drip irrigation.

Asthana (India): Before I answer your question, I would just like to take a minute to talk about why infrastructure is such a challenge. Agriculture is a business. If you look at the leading global companies in agriculture, across the spectrum, none of these companies make more than 2%–3% of their revenues in terms of margin. If we look at the farmers at the other end, typically it is an extremely difficult profession to be in. Public spending in India for almost a decade and a half now has focused so much on industry and services that there is no capitalization in terms of building agricultural infrastructure.

There are also two emerging trends. Statistics indicate that the average age of farmers in India is almost mid-30s and in a country with 65% of the population in the rural areas, the young men and women are simply not interested in agriculture. In the next 2 years, 50% of the people will be living in urban areas. While it is difficult for the government to create the enabling infrastructure because there is a clear viability gap, the private sector will not make big investments in the countryside, whether it is in terms of roads, power, warehouses, information technology, or distribution of water. It's a tough business and there's no margin. So clearly, the government has to step in and provide the requisite agricultural infrastructure. Collaboration between the government and private sector in agricultural production should therefore respond to these challenges.

Nag (ADB): When we talk about food security, and I am posing this as an issue for the panel, there are three aspects. First, food has to be available. Second, people must be able to buy food, so there has to be income. And the third part is distribution. What is the role of retail in food security?

Asthana (India): From the discussions in a previous session, I believe that some sort of utopian thinking is going around when we say that we can create a global stock pool which will rationalize the prices. Responses of countries in times of crisis are extremely inward looking and there is a complete political economy to operate and countries are extremely reluctant to share their stocks with the international community. That is one issue.

Another issue is that if we look at India, for example, or even the crisis of 2008, it was sufficiently demonstrated that the world had ample stocks at all points in time if the distribution structures were more efficient to respond to the demand and supply situation. Had the distribution structures been in place to efficiently distribute those stocks, the prices would not have risen as much. So part of the inefficiency of distribution, of the market mechanism or the market forces, or even the role of the private sector in terms of mitigation, is giving a heads up that there is likely to be a crisis and how the government could move the stocks faster.

Industries can play a big role in organizing retail. There is a fundamental belief that we can continue paying higher prices to the farmers and yet deliver to the consumers at a cheaper level. This is clearly demonstrated if you have a well-invested supply chain in place, if you have efficient infrastructure that looks at the advance information as to whether demand is likely to come, and if your response to logistics is efficient enough to reach your stocks well in time.

The last point I would like to make is the emerging issue that food security is purely linked to cereals. Farmers are deriving higher income from noncereal production, whether it is dairy, horticulture, or cash crops. Policy makers are faced with reconciling the fact that there is farmer income coming from noncereal production to take care of, on the one hand, while on the other, the response to food security is entirely centered on wheat, rice, and corn.

Baysa (Philippines): I will try to address your question on distribution and the role of retail in the broader context of availability. And by that, it includes inventory and supply and demand. One of the capabilities of a large retailer and producer is refrigeration. We have, for example, the capacity to stock a very large amount of frozen meat and vegetables. That, plus our capability for warehousing and for importing huge volumes, gives some level of stability in the supply and demand of commodities in the country.

Let me cite a very specific example that relates closely to a crisis. We are the biggest buyer of chicken in the Philippines and it is in our interest to make sure that the supply and demand of chicken is stable. Not an oversupply, because it will bring down the profits of farmers and producers. It will kill them and eventually hurt us. Not an undersupply either, because the cost will go up. So we have to make sure that we have developed enough farmers and suppliers such that the orders of chicken will be just right, that there is enough supply, and that farmers and producers make enough money. When there is a typhoon in the Philippines that kills a lot of chickens, what we actually do is to work with the Department of Agriculture to allow us to import chicken from the US as soon as possible. The government works with us very fast, because they know it is very critical. This cooperation stabilizes the cost of chicken not just for us but for the entire country.

The same thing goes for rice. During the rice crisis a couple of years ago, there were rumors of rice shortage in the Philippines. Frankly, we had enough supply or inventory of rice. But to help manage this crisis, we worked with the Department of Agriculture and with certain rice buyers to import rice from Viet Nam as soon as possible. As the news came out that Jollibee, other private sector groups, and the Department of Agriculture imported rice from Viet Nam, the panic subsided.

Nag (ADB): Let me try to encapsulate three points so that we can have a discussion involving all of you. First is public–private partnership and its importance. I am very pleased that the private sector thinks that the role of the government is actually quite important, though I did hear Mr. Rajbhandary point out that it is important that government should not only provide the enabling environment and the enabling infrastructure but also know when to get out of it or let others come in.

The second one, which I think Ranjit Page covered in a very important way, is the whole notion of corporate social responsibility, such as the examples you gave of Cargills starting it and leading to a partnership with the government in some very important public policy discussion such as water. And the third is that food security is not just a question of production. Food also has to be available at the right places and affordable for the people to buy. Income is very important.

How do you stabilize the incomes of the farmers but at the same time make sure that the cost to the consumers does not go up disproportionately? Now let me throw it open to the audience for questions to pose to the panel.

Open Forum

Question (Daphne Roxas, Asian Women's Network on Gender and Development): I noticed in the discussions that working with government in partnerships seems to be a smooth endeavor. But this is when the playing field is level. What if there are aberrations in these partnerships? Can we talk about transparency and corruption in terms of working with the government?

Page (Sri Lanka): I think the question about corruption and transparency is a very important one. We have gone through a series of situations in the last 2–3 years, one on the food shortage and the other on the financial crisis. Both the public sector and the private sector have had some role to play in these crises. I believe that both sectors need to be very transparent and free of corruption.

Bharati (India): I can only speak about our experience in India, working with the farmers and government agencies. We have not really faced any challenge with regard to corruption. First, we have very sound governance structures in terms of the way we deal with partners because otherwise we would not have that relationship. Second, even if we were to face the challenge of corruption from any public sector agency, we would not entertain it because it is part of our corporate values.

We are absolutely transparent. None of our employees are allowed to entertain any request for corruption in any way. As far as farmers are concerned, all payments are transparent and within 48 hours all checks are delivered. We have over a 95% retention rate with our partners. We have worked with them for 10 years so there is complete transparency and trust that have been built over a period of time. We are on the right side of politics, in the sense that we are working with the farmers, and the government welcomes us because we are doing something good for the farmers. That is perhaps one reason why, particularly in the area of agriculture, we would never experience corruption.

Kopot (Indonesia): In the past, the government would engage the services of consultants or experts to prepare the strategies for development programs. But quite often, these strategies are not implementable. Many programs failed and poverty continued to increase. The present government in Indonesia has adopted a pro-poor, pro-job, pro-business, pro-growth, and pro-environment policy and has put together a team to prepare the strategies and programs. There is more engagement now with the private sector.

At a national summit in 2009, ministers from 11 government agencies met and discussed with the private sector the issues, desired targets, the rules and regulations at both the central and local government levels. The private sector proposed changes to make the strategies and programs more implementable. My view is that government should dialogue with the private sector more often so that government programs could be more implementable.

Malua (Pacific Subregion): I guess the private sector is viewed as the watchdog for governments. Usually the government makes sure that we pay our taxes on time. On the other side, the private sector has to make sure that the policy mechanism and implementation of policy are transparent. In our working relationship with government, we are now influencing policy through the development stages rather than waiting for the implementation stage.

I would like to respond to the first question, especially like when your daughter does not want to take up farming. I have always been preaching that food security starts with everybody. You can start growing your own food so that you do not have to rely on the market. Even though we have children who want to take up careers in new areas, farming is still important and growing of food can still be instilled in them. When the youth leave us, it is a critical issue not only in the Pacific but also in other regions. Provide opportunities in a sexy way, so that the youth will remain in the village and do projects in farm production. At the same time we have to nurture them because of the challenges.

Rajbhandary (Nepal): Corruption depends on what form of government, what kind of government, what kind of ministers. There may be corruption in the government and the private sector. It depends on the kind of people. It is all guided by morality. How you are accountable to your work will contribute to your people.

Question (Ashok Gulati, International Food Policy Research Institute): When we look at the private sector, we expect them to give us business models that work at the bottom level of the economic pyramid. That is where the food security link is all about. Now let us look at three critical things of the new technology that is generated for the masses and that has reduced poverty in the world—seed, fertilizer, and water.

Look at seed. Coming from India the last 10 years, the biggest success story would be BT cotton seed. But look at the companies controlling the seeds. They wanted to sell the seeds at Rs18,000 for a 450 gram packet. Farmers could not afford that. There was huge outcry, the nongovernment organizations went to court. Finally the state intervened to bring the price down from 18,000 to 6,000 or so. If the state had not intervened, today India would not have been the second biggest exporter of cotton in the world. Today, 88% of India's BT cotton is in the hands of smallholders. But there is a major conflict in pricing because companies want to work at the top of the pyramid since their first objective is to maximize profit. So how do you provide the incentives for them to work at the bottom?

Second, take the case of fertilizers. The biggest subsidy in developing countries is on fertilizer. You call it public–private partnership. But what does the fertilizer industry do? It jacks up its cost, the so-called "gold-plating" of the fertilizer industry. They say our cost is very high, if you want us to help the farmers give us 50% subsidy. Where is the transparency? Where is the social audit of those companies?

You come to water. We admire what the water companies are doing. But if the government of India does not give 50% subsidy on drip irrigation, will that irrigation expand to the masses? What is the real cost? What is the stated gold-plated cost on which the subsidies are built?

So my question is, what are those viability gaps that need to be put transparently on the table?

Padmanabhan (India): Look at the water issue. First of all, as I said private enterprises have to do business. There were cases in India that government organizations and private companies have to decide on the prices. You should realize that when micro-irrigation projects started, there was a price fixing meeting that took 6 months. Private parties provided the material list required for the special system and there were government organizations collecting information from everywhere in the world and they came up with a common fixed price. So it is not, please do understand, the private parties here that dictate the price they like. It's not like that.

Asthana (India): I think there are two sides to this question. One is that all the three examples are absolutely valid. Private sector getting more for whatever it has done and seeking their normal profit in specific instances is absolutely incorrect, especially when it comes to a country like India where high levels of poverty exist at the farm gate. Clearly, that is something unacceptable and I think government has to play a role to make sure that this is managed more efficiently.

But I am actually putting this whole issue back to the government policy makers. The big challenge, especially in the case of developing countries, is that the speed of business has moved way too fast for the capacity of the government. This is linked ultimately to all the policies that are being formed or misused or lacking; that is a critical element here.

Bharati (India): I would answer the issues that Dr. Gulati raised in two parts. As far as PepsiCo's supply chain is concerned, we do not need any viability gap because it has to be part of our own cost structure. And we would not like to be dependent on anybody in any case. We need a risk-free supply of that input at the right time at the right quality and we want to control it ourselves. That is point number one.

Having said that, let me turn the question the other way. We have extension capability. We can transfer knowledge to the farmer and we can partner with research organizations like the Indian Council of Agriculture Research, for example. If the government of India wants to tap into our capability, then, on a cost basis, we are willing to do something. You can utilize our expertise for delivering a public good and I am sure other private sector groups also have capabilities that can be channeled to deliver a public good. So that would call for a different kind of

public–private partnership and whatever kind of funding you call it, whether it is viability gap, but it is not from our business interest.

The second point is perhaps multilateral agencies can play a role. For instance, we also have the Quaker Oats brand. We work with Canadian universities to develop particular varieties of oats that can be cultivated by the farmers and finally packaged as breakfast cereal. We would be very happy to partner with the government research agency to develop an appropriate variety for the Indian environment. I do not think, however, that the Indian government has a model where our intellectual property rights would be respected. The right kind of commercial transaction between a public sector research organization and a private sector company can be developed. Maybe some technical assistance can be provided by multilateral organizations in identifying what global best practices there are between private sector companies and research organizations which are win–win for both. If they can be worked out, I think we can move in that direction.

Question: One of the success stories cited is the oil palm plantations in Indonesia. These plantations have been known to adversely affect the local communities and this issue was already brought to the United Nations. Very recently, the World Bank has decided to stop providing further loans for oil palm plantations. What is the reality on the ground and how can the big companies address adverse effects on the local companies and local communities who lost their livelihoods?

Kopot (Indonesia): This has become a very interesting topic in Indonesia and Malaysia. In the 1980s, palm oil was the subject of a negative campaign in the United States because of claims that palm oil is very bad for the health. A study about palm oil and other edible oils found that other edible oils are more harmful, and that negative campaign stopped. But this was followed by another negative issue about oil palm plantations destroying the forests in Indonesia. The truth is oil palm plantations in Indonesia only occupy 7.3 million of the 80 million hectares of forest land that has been lost to date. Yet, another issue being thrown against oil palm development is about the loss of peat soil. Palm oil plantations probably occupy only 300,000 of the 50 million hectares of peat soil.

Nag (ADB): May I request the members of the panel to give a 1-minute summation of their views on the matters discussed today.

Malua (Pacific Subregion): Sustainability of a project is very important, for whoever provides projects or programs at the grassroots level and especially for the farmers. In the Pacific islands, we work with the markets that provide and promote community trade, that believe in the farmers' work, and where, in terms of the fair trade movement, the majority of the money goes back to the farms. Hence, you have to look at the whole integrated system where the market also promotes the interest of the farmers.

A question had been asked about coordination within the private sector and if there is any interest and collusion. For us in the Pacific islands, we consider everything as an opportunity for working together. Because we are a small market, we look at opportunities to influence policy as one voice and to seek further markets. In terms of food security, we always believe in opportunities for all and the private sector is working with the government and the international community, which have been very instrumental in assisting us because we do not have other resources like capital, etc. We would like to take advantage of any opportunity that is available out there.

Baysa (Philippines): The questions this afternoon center on goodwill and about governance and abuse. I think no amount of system can really guarantee goodwill. A large company can abuse, a small-scale farmer can abuse, the government can abuse, anybody can abuse. In the United States, they are talking about regulations in the financial institutions as a result of the financial crisis. But I think there is really no guarantee. What we need to do is to keep on seeking companies and governments that exemplify the kind of goodwill and results that we are looking for, and let us emulate them.

I am sure there are very good examples and inspirations. We should continue to look for inspirations. Let us build the critical mass of goodwill from private companies. There are companies that are horrible. But there are companies that are very admirable. And there are governments, even small governments we have worked with, that are also admirable. What we see in the localities are very hardworking and very competent officials. These are the mayors, councilors, and *barangay*[1] captains that we look for. And when we find them, we work hard with them. One of the key things that make us successful is very competent and very clean government officials.

By the way, we have embarked on a project to train local government officials. We partner with the Asian Institute of Management and the Ateneo University to train local government officials on managerial ability.

Kopot (Indonesia): A good and equitable company will have to practice corporate social responsibility—but corporate social responsibility that looks into and builds the economic relationship between the company and the communities surrounding its operations. Without the economic aspect, and if there is only the social aspect, there is no long-term relationship. In palm oil, for instance, if 42% of the total area belongs to the smallholders, that is equivalent to 1.5 million farmers. I cannot imagine any other crop in Indonesia that has that number of farmers. Big companies have the obligation to support the smallholders and contribute to upgrading their living standards.

[1] The *barangay* is the lowest level of government in the Philippines–Ed.

Asthana (India): I would just say three things that are extremely important. One is that the whole process of dialogue among the private sector, the government, the multilateral agencies, and nongovernment organizations must move toward a more actionable agenda beyond the discussions in the conference. That actionable agenda must be defined more at the country level so that there are more specific solutions. The second is that we must build capacity whether in the farming community, the government understanding of the business, or the sensitivity of the private sector to the issues that have been raised. It is more important to understand each of the concerns and be able to address the issues. Third, I think solutions are not driven by large-scale, massive discussions around various issues. Both the government and the private sector must decide on a project mode. If we break down this whole complex thing into different unitized structures and modules, we will be able to move much faster toward solution in a very practical, sensible, and measurable way.

Page (Sri Lanka): I would say that it is important for the multilateral agencies to get the private sector involved in some of their programs. Get us on board. If we are to achieve what we have been discussing for the last 2 days about food security, it would be very difficult to do so without the private sector. We need to take the learning from the past decade, lessons from the region, and from us here or from other parts of the world, and see how best we can get the agencies to partner with us to move forward.

Rajbhandary (Nepal): We have been working with the government for quite a long time. If the achievement is less than the rate of population growth, why not look at least once at how the private sector operates. Let us continue working with the donor agencies as well as the government. Who knows, we may be partnering better than we had before.

Padmanabhan (India): We all know that we are not living in a perfect world. None of the relationships is perfect but we can continue to improve. And that's what it is. Private sector makes investments, generates technology, and generates material. They have to partner with farmers, with the governments, with institutions. It is a process and it has a long way to go. As we proceed, I am sure developments, modifications, and corrections will happen.

Bharati (India): The theme that you have chosen, food security, is a huge challenge. The more that you look forward, it becomes an even greater challenge. No single entity can address the issue. You have to connect all the dots. To me that is the key because knowledge dissemination, application on the ground, and faster delivery, all these will require for all stakeholders to come together.

Nag (ADB): Allow me to just make some observations or a few takeaways from this session. What struck me from this panel was that nobody questions the basic premise that food security is achievable. I felt the private sector's sense of optimism and "can do" attitude. But underlying that, there were four points which struck me.

The first one was trust. Nobody questions the importance of partnership. There is, however, some kind of trust deficit, which seems to come through from the discussions, (such as) the (conflicting) roles of the public and the private sectors. Trust is one thing that we have to be working on much more.

The second point was the critical role of the private sector, not just in the business sense but in the setting of public policy. The need to create the right environment for the private sector to invest and operate in infrastructure was very well articulated. There is a huge amount of infrastructure investment that only the public sector can make.

Third is capacity development. In spite of best intentions, governments need to better understand the business model. The government needs to understand how the private sector works and the private sector needs to understand how the government works.

The last is this whole concept of equity. I think there is a feeling that in all these partnerships, the person at the bottom of the pyramid is the one who gets left out. The challenge for all of us—multilaterals, political leaders, public sector, and private sector—is to make sure that ultimately the people at the bottom of the pyramid think they have been fairly treated. I don't think they would necessarily want a guarantee but they certainly want to be assured of fairness.

The voice of civil society organizations: Investments for food security in Asia and the Pacific — For whom and for what?

An integral side event of the Investment Forum on Food Security was the consultative meeting of civil society organizations (CSOs) on 5 and 6 July 2010. The meeting, with the generous funding and all-round support of the United States Agency for International Development (USAID), brought together more than 60 delegates representing CSO regional formations of farmers, fishers, indigenous peoples, rural women, youths, and other sectors from 13 countries in Asia and the Pacific. They discussed the perspectives of the rural sectors and how to factor these into the new strategies for advancing food security. The Asian Partnership for the Development of Human Resources in Rural Areas (AsiaDHRRA) was instrumental in organizing every aspect of the consultation, including facilitating the discussion process. On 9 July, at Session 9 of the forum, CSO representatives presented a common position paper highlighting their thematic priorities and policy recommendations.

We, representatives from national and regional organizations and cooperatives of small-scale women and men farmers, fishers, and indigenous peoples, rural youth and women, and development nongovernment organizations in the Asia and Pacific region, wish to present to the delegates of this Investment Forum organized jointly by Asian Development Bank (ADB), Food and Agricultural Organization of the United Nations (FAO), and International Fund for Agricultural Development (IFAD) the following:

Away from "business as usual" approach

Partnerships and investments to promote food security in the Asia and Pacific region cannot proceed in the "business-as-usual" approach. Our work and study with poor communities consistently show that large-scale trade, technology, and business practices of large agro-industrial corporations have marginalized and further displaced smallholder producers, who lost their access to and control over productive resources and assets.

National and regional policies, particularly in financing and trade, have reinforced these failures and continuing food insecurity in many countries.

We welcome socially responsible private investments in agribusiness with the condition that they are benign and equitable and work for the betterment of the small-scale farmers. We are totally opposed to business models that are

exploitative and result in the marginalization and displacement of the small-scale rural sectors.

The need for change

There is a need to bolster investments in food security. But these investments should be within the framework of sustainable, pro-poor agricultural policies in the region and should correct the misguided priorities on export-oriented agriculture production; market solutions; and industrial, chemical-intensive agriculture. In line with this, we propose that investments should do the following:

- Adhere to the principles of human rights, farmers' rights, fishers' rights, and indigenous peoples' rights. There must be recognition and institutionalization of the farmers' rights to land and other productive resources in agriculture. This includes as well the rights to benefit sharing from the use of plant and animal genetic resources.
- Support sustainable food production using integrated, diversified, organic, and eco-intensification farming systems and approaches.
- Increase public investments in irrigation, postharvest facilities, rural infrastructure, and research and technology.
- Oppose monopoly control in domestic food and agricultural trade, and strengthen farmers' participation in markets and in the value chain through farmers' organizations and cooperatives.
- Make the policy shift toward enhancing food self-sufficiency and away from export-oriented agricultural production, and toward enacting appropriate land use policies, import control and tariffs, price support, and subsidies.
- Promote changes in the design of partnership agreements among stakeholders to truly empower smallholder producers.
- Urgently invest in disaster risk reduction and adaptation to protect farmers from the effects of climate change.

Along this line, responsible public and private investments and grants should be made to

- governments, CSOs, small-scale farmers, fishers'organizations, and the small-scale private sector;
- public research and development;
- quality and appropriate extension services and systems;
- infrastructure that will improve access to agriculture and aquaculture resources to the poor women and men farmers, fishers, indigenous peoples, and enable them to produce food for communities and secure their livelihood systems;
- promote ecologically sound farming, forestry, and fisheries systems;
- validate and upscale sustainable and farmer-led pilot projects, including community-based seeds and breeds initiatives;

- support production, postharvest, and marketing services for the development of local value chains and to give access to markets;
- promote and enhance farmers and fishers associations and cooperatives and social enterprises as the social economy institutions of the small-scale farmers and producers; and
- ensure that women are given priority in all investments on agriculture and food security and are meaningfully engaged in designing, implementing, managing, monitoring, and evaluating these sustainable agriculture and food security projects.

Our calls

- We call for significant participation of CSOs in setting and/or reviewing the food security and sectoral policies of ADB.
- We call for ADB to ensure its commitment of $2 billion a year and increasing it to support smallholder sustainable agriculture related to food security and sovereignty initiatives, including concern on nutrition.
- We call on governments in the Asia and Pacific region to devote at least 10% of national budgetary resources to sustainable agriculture.
- We call on governments to ensure rationalized land and water use to ensure protection of natural resources for food production which guarantees access and control of small-scale farmers, fishers, and indigenous peoples to these natural resources.

On institutionalizing meaningful participation of social movements and civil society in processes related to investments for food security processes

The space provided for civil society in the Investment Forum is appreciated and is considered a basis for further improved dialogues, notably enhanced support for participation of small-scale food producers. We call on ADB, FAO, IFAD and its member states to:

- create a permanent mechanism to facilitate the meaningful participation of smallholder agricultural producers, workers, and enterprises that will guarantee that their interests are adequately represented at such fora and in accompanying processes, building on existing initiatives, processes, and institutions; and
- encourage and facilitate the participation of CSOs in ongoing and future agricultural investment-related programs on capacity development, research, extension, etc.

Our commitments

We, the civil society participants in this gathering, are committed to working together to make our governments, intergovernmental bodies and the IFIs and

multilateral agencies, other donors, and socially responsible private sectors to respond to the needs of the poor and marginalized.

- We will continue our efforts to make these agencies and their member states—our governments—accountable to the needs of the region's peoples through constructive and principled engagement in various processes and the monitoring and evaluation of their work.
- We will contribute our expertise in the deliberations on the substance and methodologies of the various agricultural investments for agriculture at national, regional, and international levels.
- We will cooperate with development partners who are respecting the principles set forth and are willing to work along the agenda proposed herewith.
- We will intensify our efforts in empowering local communities to contribute toward and benefit from sustainable development efforts in the Asia and Pacific region.

Specific recommendations

Replication and upscaling of sustainable, organic agriculture

These agricultural systems have been developed over the past three decades without or with little assistance. They have proven to increase productivity and smallholders' income and quality of life. They include technologies such as integrated and diversified farming; systems of rice intensification; bio-composting; vermiculture; low-input agriculture; integrated pest management; community seed banking; use of small-scale community-based renewable energy such as biogas and charcoal briquettes; domestication of other livestock species (other than cows, pig, sheep, chickens, and goats); and early warning systems and weather forecasting combining both traditional and modern science-based knowledge.

It is time to increase investments and assistance to replicate and upscale these systems in the interest of sustainable food security and poverty alleviation through the following:

Agricultural research and development (ARD). The following are recommendations for further research and development in agriculture:

1. ARD and extension investments should be based on the needs of smallholders and should bring immediate relief as well as mid- and long-term solutions. Smallholders shall be involved directly in the identification, design, implementation, and monitoring of research activities.
2. Invest in the research and documentation of various traditional, local knowledge and practices on crop breeding, seed banking, integrated pest management, organic fertilizers, energy-efficient mechanisms (small-scale bioenergy technologies) and other technologies and practices; and in knowledge sharing and information dissemination.

3. Prioritize public research on soil fertility, pest and disease management, seeds and breeds for low input, and organic agriculture.
4. Investments in ARD shall be increased and be shifted from agrochemical agriculture systems to agroecological organic systems. Other priority areas in ARD should include protection of the environment, promotion of biodiversity, natural resources management, and climate change adaptation.
5. We are gravely concerned about the growing interest on the focus and resource allocation on genetically modified organisms, and the growing pressure on governments of developing countries to devote their meager research and development funds to capital-intensive and high-input technologies. We urge ADB, FAO, and IFAD to conduct a study on the cost-benefit analysis of public investments on genetically modified organisms and agrochemical farming systems, as compared to low-input, agroecological agricultural systems.
6. The precautionary approach as adopted by the Rio Convention on Sustainable Development should be used in ARD.
7. ADB, FAO, and IFAD shall seek cooperation with additional research initiatives and institutions promoting agroecological organic research institutions, rather than limiting support and activities to traditional partners such as the International Rice Research Institute (IRRI) and the Consultative Group on International Agricultural Research (CGIAR).
8. Strengthen links between research, advisory, and extension services to promote sustainable agriculture; strengthen partnerships between research institutions, extension workers, and organizations of smallholder farmers, particularly women.

Support services and infrastructure. Invest in the important support services that directly benefit small-scale farmers: community-based irrigation, accessible and affordable credit, farm-to-market roads, crop insurance, early warning and weather forecasting systems, and postharvest facilities.

Connectivity. Invest in the development and improvement of traditional, local markets including wholesale markets owned and managed by local governments in partnership with organized small-scale food producers.

Invest in enhancing the position of small-scale farmers in the sustainable agricultural food value chain to become significant players in the management and coordination of the sustainable value chain through

- farmer-friendly market information mechanisms to help small-scale farmers make informed decisions (price, demand, market standards and requirements);
- promote collective/group marketing by investing in the formation and organization of commodity-based producer's associations and cooperative support service providers that will assist in capacity building (organizational development and skills, such as negotiation skills) and networking of

producer's cooperatives and associations as well as consumer groups;
- soft loans for start-up capital for trading and marketing; and
- subsidy for basic infrastructure: pre- and post-harvest facilities (drying, milling, etc.) and a stable energy source.

Sustainable management of land and natural resources

Access and control of land, water, and common property resources by small-scale farmers, fishers, and indigenous peoples are critical in enhancing food security and lead to sustainable natural resource management.

Land and natural resource management is nowhere in the priorities or core areas of operation of ADB's Strategy 2020. We call on ADB, FAO, and IFAD to ensure that all of their investments will facilitate promotion and protection of the rights of farmers, fishers, and indigenous peoples, including their right to land, water, forests, and seeds as contained in the United Nations (UN) Voluntary Guidelines on the Realization of the Right to Food, Article 9 of the International Treaty on Plant Genetic Resources for Food and Agriculture, and the UN Declaration of the Rights of Indigenous Peoples.

ADB, FAO, and IFAD should assess large agricultural investments for how these rights are respected and promoted. Investments that could alter the natural balance of the environment or the ecosystem should be prohibited.

CSOs supported by a diversity of development partners, including FAO and IFAD, have developed models and systems of community-based agroforestry, coastal resource, and watershed management, as well as integrated, diversified, organic farming systems and systems of rice intensification, which are worth replicating and upscaling. They should be more aggressively advocated and promoted by the private sector and governments.

Participatory governance and management

Along these lines, we recommend ADB, FAO, and IFAD to
- Use participatory approaches in decision making and management of projects. Mechanisms for consultations that have a real bearing on subsequent decision-making and management processes should be institutionalized.
- Review the food security and sectoral policies of ADB with the participation of the CSOs.
- We call on FAO and IFAD to continue the reform process of the Committee on Food Security, particularly at national and regional levels.
- We call for independent mechanisms for monitoring investments in agriculture across the region, including CSOs and development partners.

Focus on women farmers, fishers, and indigenous peoples

At the UN Millennium Review Summit this 2010, it was highlighted that supporting women farmers must be the focus of coherent, appropriately budgeted

national plans to make a 5-year breakthrough against hunger. This is because in Asia and the Pacific, women are in charge of putting food on the table, and do 50%–80% of the agriculture work. Investments can be made in labor-saving devices for women, improving their crops and varieties, training and extension work with them, and securing their rights to land and access to financial services. Research and experience have shown that projects and activities managed and implemented by women generate more success.

Invest in activities that motivate the rural youth to engage in agriculture

Young farmers are the future of agriculture. Capacity-building and enhancement programs for the rural youth to engage in sustainable food production and agriculture and rural employment shall be supported.

Invest in organizing and capacity building with farmers, fishers, and indigenous peoples

Massive replication and promotion of technologies will be more efficient and rapid if we work with organized groups of small rural producers. Emphasis can be placed on developing people's organizations and cooperatives along geographical and crop/commodity lines, as well as in investing in business associations and scientific organizations supporting the needs of small-scale producers and entrepreneurs to capture and add value to on-farm, postharvest, and off-farm enterprises.

Adopted by Participants to the CSO Side Event and the CSO Special Event during the Investment Forum 2010

Agribusiness Action Initiative (AAI)
Aliansi Petani Indonesia (API)
Asia Indigenous Peoples Pact (AIPP)
Asian Farmers Association for Sustainable Rural Development (AFA)
Asian Partnership for the Development of Human Resources in Rural Areas (AsiaDHRRA)
Center for Agricultural Extension Volunteer – CAEV-VietDHRRA
Cambodia Farmers' Association for Agricultural Development (CAMFAD)
Cambodian Center for Study and Development in Agriculture (CEDAC)
Cambodian NGO Alliance for Cooperation (CNAC-CamboDHRRA)
Farmer and Nature Net (FNN)
Farmers' Federations' Association for Development in Thailand (SorKorPor)
Farmers' Life Improvement and Future Light Youth Organization
Indonesian Farmers and Fishers Society Organization (WAMTI)
International Federation of Agricultural Producers (IFAP-Asia)
International Federation of Organic Agriculture Movements (IFOAM)
National Cooperative Union of India (NEDAC) and NEDAC-Asia
Organic Agriculture Association of Thailand
Pacific Islands Association of NGOs (PIANGO)
Pambansang Kilusan ng Mga Magsasaka (PAKISAMA)
Peoples Service Organization
Phil Partnership for the Development of Human Resources in Rural Areas (PhilDHRRA)
Philippines Peace and Equity Foundation (PEF)
Regional Network for the Development of Agricultural Cooperatives in Asia and the Pacific
Save the Children-Philippines
Social and Economic Developers Association (SEDA)
STAR Kampuchea
National Pingtung University of Science & Technology (NPUST)
7 of 7
Vietnam Farmers Union (VNFU)
Women Organizing for Change in Agriculture and Natural Resources Management (WOCAN)
World Vision International
World Fair Trade Organization (WFTOA)

Chapter 11

Road map for change

Where to now, Asia? The takeaway for all in the Asia and Pacific region's first Investment Forum on Food Security is that the region has a wealth of innovative technology and good practices—along with an abundance of natural and human resources—toward ensuring food for all. The challenge is how to harness and channel all these assets to feed the hungry in a sustainable way. Three development partners that spearheaded the forum charted the road ahead in their closing remarks on 9 July 2010.

The chapter closes with the Asia and the Pacific Regional Food Security Partnership Framework, which forges a 3-year partnership among the Asian Development Bank (ADB), Food and Agriculture Organization of the United Nations (FAO), and International Fund for Agricultural Development (IFAD). The partnership aims to address specific food security issues in the region. The partnership document was formally signed by the heads of the three organizations on the occasion of the UN Summit on the Millennium Development Goals on 20–22 September 2010.

Summary Remarks of Ursula Schaefer-Preuss

Vice President
Knowledge Management and Sustainable Development
Asian Development Bank (ADB)

In his welcome remarks, ADB President Kuroda urged us to move out of our comfort zones and forge new partnerships, collaborative arrangements, and networks with the single objective of achieving Food for All. In these past 3 days, this was exactly what we set out to do.

We set two objectives for ourselves. First, we said that this forum will serve as the venue for sharing the innovations and good practices on multipronged approaches and multistakeholder modalities of partnerships geared toward sustainable and inclusive food security. We had the Marketplace, where 16 exhibitors showed us what innovations and good practices they have been adopting to increase efficiencies in the food and agriculture value chains.

Yesterday, 8 July, we exchanged notes on novel and out-of-the-box approaches that have worked and may be ready for replication and scaling up. We also shared a suite of institutional arrangements for linking small-scale farmers to the markets, as well as enabling policies and regulations that can spur further innovations. These cover areas on productivity, connectivity, resilience, regional cooperation and integration, trade, and financing. The takeaway for all of us is that the Asia and Pacific region has a wealth of innovative technology and good practices. The next step for all of us is to document these innovations and good practices, see which ones can maximize impact positively on the extremely poor and disadvantaged groups, and try out these innovations and good practices either for replication or for scaling up.

The second purpose of the forum is to serve as the venue for discussions among various stakeholders toward the forging of partnerships and collaborations in support of sustainable and inclusive food security. We had the series of discussions and one-on-one dialogues on what Bangladesh, the People's Republic of China, India, the Lao People's Democratic Republic, and the Pacific subregion have been doing to cope with the demands for sustainable food security for their respective peoples, the investment opportunities for food security, and areas for building partnerships. Our takeaway from these country-level discussions was that no one model for partnership fits all. Thus, while there is a suite of innovations and good practices, these need reality checks at the country, local, and household levels. This will be done in our follow through after the forum.

Further, in the sessions with development partners, civil society organizations, and the private sector, we challenged conventional schools of thought on food security paradigms, and put forward the essentials for the new thinking on and partnership modalities for food security. Our takeaway from these interactive discussions was that the key players in the region's food supply chains—the public sector; nongovernment organizations; producers' groups; agricultural research centers; multilateral and bilateral development agencies; and small, medium, and large agribusiness entities— share and agree on several key principles for collective work on sustainable and inclusive food security. These are the following:

- focus on smallholders;
- food security initiatives have to be multisector and multistakeholder, with emphasis on nutrition, gender mainstreaming, and good governance;
- novel partnerships must be forged; and
- there has to be country ownership for these partnerships to move forward.

The next step is for us to identify the low-hanging fruit that we can use to lay the foundations for building our trust and confidence as equal partners for food security. In this regard, we are happy to see that the first step of building partnerships for sustainable and inclusive food security has been taken by the three organizations—ADB, the Food and Agriculture Organization of the United Nations (FAO), and the International Fund for Agricultural Development (IFAD). Today, 9 July, we witnessed the signing of the Asia and the Pacific Regional Food Security Partnership Framework. Its formal signing will be done at the Millennium Development Goal summit to be held in September 2010.

The partnership is open to all, and we certainly will welcome your participation. The framework lays out the principles, but we intend this to be the basis for establishing specific results-oriented measures.

In conclusion, let me stress that the forum is the beginning for further actions. For ADB and our partners, we are determined to follow through this regional partnership with concrete actions. There are good indications that you may consider joining us in this endeavor. In the meantime, we urge all here that, as we end this forum and part ways, you will heed our call to join hands and walk the talk.

Summary Remarks of Hiroyuki Konuma

Assistant Director-General and Regional Representative
for Asia and the Pacific
Food and Agriculture Organization of the United Nations (FAO)

First of all I would like to thank the Asian Development Bank (ADB) for hosting this very important forum here at the ADB headquarters. I would like to thank all ADB colleagues who have contributed to the success of this forum. I also wish to thank our colleagues from the International Fund for Agricultural Development (IFAD), my own colleagues from the Food and Agriculture Organization of the United Nations (FAO), and other development partners who contributed to the discussions and presentations. The quality of the technical presentations has been excellent. The presentations have generated a great deal of interest and facilitated the discussions and dialogues as well as the identification of follow-up actions.

I believe this is the first time for the Asia and Pacific region to have such a comprehensive forum focusing on food security and participated in by important and well-recognized scientists, policy makers, and development partners. I would like to thank everybody for participating in the forum and for having stayed for the full 3 days.

It has become very obvious that food security issues are upon our shoulders to be tackled. It is not just a short-term emergency issue, but a medium- and long-term issue to feed our children and future generations to come. The issue is not easy to resolve, but we have to attain our goal to meet the demands and the requirements of a growing world population. Otherwise, it might cause civil conflict or political unrest, as happened in some countries during the time of soaring food prices in 2008. Food is a commodity that is crucial to maintaining world peace. Those of us engaged in agriculture, food security, nutrition, and its associated fields should continue to advocate the importance of food security and agriculture to the people of the world.

Food security is not just a matter of increasing food production. We have to look at food security as a comprehensive task involving supply, access, and utilization that can be attained only through concerted efforts and through a multisectoral and multidisciplinary approach. We must always keep in mind our ultimate goal, which is to reduce poverty and eliminate hunger.

During this forum I have gathered key messages and noted key issues:

1. **Pro-poor and small-scale farmer-centered approach.** It was recognized clearly that 74% of farm households are in the Asia and Pacific region. Over 80% of them are small-scale farmers who are contributing significantly to

food production in this region despite owning very little land. The average landholding of farmers in this region is 0.3 hectare against the world average of 1.4 hectares per farming household. Small-scale farmers also constitute the majority of the poor and hungry population. A pro-poor, small-scale farmer-centered approach is therefore very much needed. By having small-scale farmers produce more food, they can generate more income in a sustainable manner, which will lead to the availability of even more food at an affordable price to the consumers, leading to promoting national and global food security. We call it the twin-track approach, an important agenda that must be pushed.

2. **Crop diversification and agricultural diversification.** While pushing for increased food production, we need to also recognize the importance of balancing cereal production with other nutritionally valuable food production, particularly vegetables and fruits, meat and milk, and fish products. In many countries in this region, chronic hunger is not just a matter of lack of energy intake. A majority of the undernourishment is energy–protein malnutrition and micronutrient malnutrition. If we are to eradicate chronic hunger, we have to balance our approach. We must put equal importance on increasing cereal production and on crop diversification and agricultural diversification to produce balanced food. At the same time, this will contribute to enhancing farmer income and also provide employment for women and other members of the farming household.
3. **Enabling policy formulation is very important.** We need to review policies and make them more comprehensive. Agricultural policy alone will not work. Nutrition policy alone will not work. We need to have a comprehensive food security policy that will lead to plans of action and investment plans similar to what Bangladesh and some other countries have demonstrated.
4. **Mobilizing resources for investments.** The comprehensive food security policy and action plans should lead to investment plan formulation, which has to be done in a participatory manner, involving policy makers and various levels of stakeholders, including national committees. At the same time, we need to rationalize investments. Investment in agriculture must be used for multiple benefits of all stakeholders for a win–win course. We should also ensure equitable benefits for developing countries, especially in terms of foreign acquisition of land for investments. It is very important to promote responsible investment in agriculture and to establish rules for the global community in such investments.
5. **Political will.** I am very glad that many ministers and policy makers joined this forum. The food security initiative starts with political will. Without strong will among policy makers, we can do very little. At the country level, policy directions and increased government budget

allocation to agriculture are very important, and I would like to seek the continued support and commitment of the policy makers who are here for finalizing investment plans, for mobilizing internal government revenue resources directly to agriculture, and for attracting external investments from developed nations and private investors.

I would like to also emphasize the importance of subregional-level actions. I would like to suggest for each subregion, under the leadership of subregional economic organizations (e.g., the Association of Southeast Asian Nations [ASEAN], the South Asian Association for Regional Cooperation [SAARC], and the Pacific Islands Forum [PIF]), to translate the outcomes of the forum discussions into subregional actions. We have agreed in principle with the ASEAN Secretariat to organize a subregional food security consultation in early September 2010 in Bangkok. We would like to invite the countries and, of course, the development partners, to join this consultation. I hope similar initiatives can be done in the other subregions, particularly in SAARC and in the Pacific island countries.

Of course, country-level plans of action are more important. This forum showcased four countries and one subregion. We are hoping that other countries that participated will follow a similar approach, particularly in tapping Global Agriculture and Food Security Program (GAFSP) facilities, which could open the new window for allocation in October 2010. I would like to add that other countries in Asia and the Pacific should start preparing their investment frameworks and plans. We are proud about our experience in Bangladesh, which received over $50 million in GAFSP resources just a few weeks ago in June 2010, and it is only one of three countries worldwide granted the resources at the first round in August 2010.

Finally, I would like to emphasize the importance of partnerships among both the public and private sectors. The challenges confronting us are enormous, and they cannot be addressed by a single agency, or by the United Nations alone, or by bilateral agencies, or even by one country itself. We have to build strong partnerships and strive to work for common objectives. I sincerely hope this forum provided the opportunity to enhance our partnerships and linkages, which will lead to our next concrete actions to be translated at the regional, subregional, and country levels.

Summary Remarks of Ganesh Thapa

Regional Economist
International Fund for Agricultural Development (IFAD)

IFAD
Enabling poor rural people to overcome poverty

I agree with the Asian Development Bank (ADB) Vice-President and the Food and Agriculture Organization of the United Nations (FAO) Assistant Director-General that the Investment Forum was a success, as it had two important highlights. First, it provided a great opportunity, through technical sessions and the Marketplace, to share innovations and good practices on approaches to sustainable and inclusive food security. Second, it also provided a unique opportunity for interactive discussions on partnership building among different stakeholders—governments, civil society organizations, the private sector, regional cooperation organizations, and development partners.

The keynote speaker, Mr. James Bolger, had left two important thoughts with all of us. First, he said, "It is a time for new thinking, as yesterday's thinking will not solve tomorrow's problems." He also said, "The policy makers must keep the questions of why the poor have no food in the forefront of any debate on alleviating hunger." I believe that we have considered these important points in all our deliberations in the last 3 days.

The one-on-one partnership discussions of showcase countries on the last day showed very different contexts and levels of preparation of the country investment plans of these countries. Bangladesh already has a country investment plan based on the country-level investment forum held in June 2010, and it has also been successful in getting a Global Agriculture and Food Security Program (GAFSP) grant from the United States government toward its implementation. The Pacific islands have also developed the regional Food Security and Sustainable Livelihoods Programme (FSSLP), which provides a harmonized framework for support from development partners for food security–related investments and programs. The discussion on India centered on the support that the development partners, particularly the three main organizers of this forum, can provide in support of the government's priorities (e.g., the 11th Five Year Plan). The presentation by the People's Republic of China (PRC) delegate focused on the PRC government's ongoing and future initiatives to support food security programs in developing countries through regional and south–south cooperation (e.g., the Greater Mekong Subregion framework).

I believe the forum provided us with a number of important messages to take home. First, there was a consensus that we need to focus on all three important dimensions of food security: production or availability, access, and utilization. Governments and development partners have in the past focused more on the

production dimension, and, therefore, there is a need to do more to improve the access of the poor to food, and also to improve the utilization of the food.

Although some progress has been made in recent years, the forum participants agreed that ways have to be found to forge stronger partnerships among the various stakeholders to significantly enhance investments to achieve food security goals. Dr. Parisak of the Lao People's Democratic Republic reminded us of the need to build partnerships based on the comparative advantages of each partner. He also informed the forum that the Agriculture and Natural Resource Group in his country provides a good platform for various partners to come together at the country level. We need to work with such platforms for better coordination and greater impact.

I agree with Professor Sen of India that the forum has constituted an important first step in bringing the private sector into the partnership dialogue, but he reminded the participants that efforts to promote their engagement have not received adequate attention. Since enormous potentials exist to improve this situation, he encouraged all of us to reflect on how to engage better with the private sector.

The civil society representatives drew our attention to the need to protect the rural poor's access to productive resources, and to promote sustainable agricultural production systems. They also highlighted the challenges faced by disadvantaged groups such as indigenous peoples, women, and the landless.

Two other issues were prominently highlighted in several discussions during the forum: the need to promote agriculture as a business opportunity for smallholders, and the need to support the rural youth as future farmers.

Many forum participants agreed that it is important to build on the lessons learned from past successful initiatives, as highlighted in the technical presentations and the exhibits of the Marketplace.

The regional partnership framework that was agreed upon among the three main organizers of the forum—ADB, FAO, and the International Fund for Agricultural Development (IFAD)—is a good beginning and we hope that other development partners and other stakeholders will join this initiative.

IFAD has played an active role in several global and regional initiatives related to food security, including the High Level Task Force on the Global Food Crisis established by the United Nations Secretary-General. IFAD also organizes on a biannual basis a Global Farmers Forum during its Governing Council Meetings. IFAD will be happy to engage with all partners through its available instruments such as investment funds, grants, analytical work, and regional and south–south cooperation programs.

Asia & the Pacific Regional Food Security Partnership Framework by and among Asian Development Bank, Food and Agriculture Organization of the United Nations and International Fund for Agricultural Development

I. Context

1. The global food and energy price surge in 2007–2008 exposed the vulnerabilities of national and international systems to issues relating to food and nutrition insecurity. While food prices came down in 2009, they remain high in several countries in the region relative to 2006 levels and the elements that were responsible for the past food price crisis are still present. Accordingly, concerns over sustainable food security remain high. Issues and strategies to deal with food security challenges have been discussed at the global level, culminating in the 2008 Comprehensive Framework of Action (CFA) developed by the United Nations Secretary-General's High Level Task Force, and are being updated at present. The challenges of addressing the specific regional food security issues in the Asia and Pacific region, however, have not been adequately dealt with.

2. Asia is home to the largest number of poor and undernourished, whose vulnerability to food insecurity is compounded by the impacts of climate change and economic shocks. Many countries in Asia suffer from the rapid depletion of land, water, and other natural resources, which impose serious constraints on productivity. The declining trend in productivity growth in agriculture is a major concern as it is a critical factor in raising incomes and job opportunities for small farmers and in ensuring affordable and adequate food for the poor and vulnerable groups. Just as Asia faces a number of challenges, however, it also has a range of promising opportunities. In many countries in the region, dynamic private sector investments are leading the development of agro-based industries that provides important linkages between small producers and markets and off-farm employment. Changing dietary patterns due to increasingly affluent urban consumers also offer important opportunities for crop diversification and nonfarm rural employment.

3. The Asian Development Bank (ADB), Food and Agriculture Organization of the United Nations (FAO) and International Fund for Agricultural Development (IFAD) share a common conviction that progress toward sustainable food security through better access to, and availability of, adequate food for the poor and vulnerable is crucial for the region's sustainable and equitable growth. To this end, they have agreed to forge a three-year partnership that is consistent with the CFA but with specific focus to support the countries of the Asia and Pacific region in achieving sustainable food security. The partnership will be evaluated jointly after three years with the opportunity to renew ties.

II. Objective

4. The objective of the partnership is to support the countries of the Asia and Pacific region in their efforts to achieve food security through increased availability of, access to, and utilization of adequate, safe, and nutritious food by the poor and vulnerable. The three organizations will provide coordinated and multisectoral support to the region's governments, taking account of their specific priorities and constraints.

5. The partnership will seek the cooperation and collaboration of governments in the region, development partners, the private sector, nongovernment organizations, civil society organizations, academia, media, and other interested regional and national organizations and associations under the country-led, focused, and prioritized food security engagement. It will also collectively seek and promote innovative financing modalities and other implementation tool kits for food security, including adoption and wider dissemination of innovations and good private sector business practices.

III. Commitment

6. The partners to this Asia & the Pacific Regional Food Security Partnership Framework (hereafter called Framework) are committed to:

- Work on the basis of the Five Rome Principles for Sustainable Global Food Security, endorsed by the World Summit on Food Security, 16–18 November 2009. These include (i) stress on plans that are nationally articulated, designed, owned and led; (ii) strategic coordination at all levels; (iii) comprehensive twin track approach to food security; (iv) commitment to multilateralism; and (v) sustained and substantial commitment by all partners to investment in food security and nutrition.
- Maximize synergies by aligning, harmonizing and coordinating their regional and country operations, with specific focus on creating concrete value addition from the partnership;
- Promote, and help develop, the governments' leadership in

coordinating the multipronged food security engagement of the partners;

- Facilitate increased private sector participation in developing and strengthening food value chains;
- Strengthening governments' and private sector capacity to plan and implement effective food security strategies and related investment programs;
- Expand and deepen the partnerships contemplated hereunder with other agencies and entities to promote food security investments; and
- Make arrangements with the relevant government agencies and regional organizations to coordinate and monitor the partnership's performance in achieving the desired outcomes and impacts.

IV. Implementation

7. The partnership recognizes the four key areas that Asia needs to act on to respond to the increasing food security challenges:

(1) Addressing the need to increase and enhance impacts of investments in food security and agriculture, covering the multi-pronged needs of Asia's "food chains" from production to processing, marketing, and distribution, in an inclusive and sustainable manner, cognizant of the specific development requirements and constraints of individual countries;

(2) Supporting the development and dissemination of crucial knowledge by the international, regional, and national agricultural research centers on improving agriculture productivity, especially of smallholder farmers, and strengthening resilience of the sector against climate change impacts and other natural/economic shocks;

(3) Facilitating expanded and more structured agriculture trade, particularly of food grains and food value chains, through greater collaboration among countries in the region; and

(4) Promoting the development of enabling policies, strategies and plans, investments, and institutional strengthening to improve household food and nutrition security.

8. Guided by the objectives and commitments described above, and by focusing on the four key areas identified, the partnership will collectively implement measures that bolster synergy in harmonized actions of the partners and significantly contribute to achieving the goal of increased availability of and access to safe and adequate food for the poor and vulnerable groups in Asia and the Pacific at the regional and country levels.

9. At the regional level, the partnership will focus its collective and collaborative efforts on enhancing the regional public goods that are needed to address the

region's systemic issues related to food security. These include the harmonization of cross-border and regional investments (Pillar 1), promotion of stronger collaboration in the prioritized agricultural research (Pillar 2), support to enhance intra- and inter-regional food trade (Pillar 3), and facilitation of sharing of lessons and good practices in the policy and institutional response to improve household food security (Pillar 4). In undertaking these tasks, the partnership will closely collaborate with, and support the existing regional organizations, such as the South Asian Association for Regional Cooperation and the Association of Southeast Asian Nations (ASEAN), and burgeoning regional economic cooperation, such as, but not limited to, the Greater Mekong Subregion, South Asia Subregional Economic Cooperation, the Pacific Islands Forum, Indonesia–Malaysia–Thailand Growth Triangle, and the Brunei Darussalam–Indonesia–Malaysia–Philippine East ASEAN Growth Area.

10. At the country level, the partners will jointly develop country food security partnership frameworks, initially covering four countries, namely, the People's Republic of Bangladesh, the People's Republic of China, India, and the Lao People's Democratic Republic, and one subregion, the Pacific, all of which have indicated their interest and commitment to lead the country process with the partners to this Framework at the Food Security Investment Forum to be held in ADB headquarters on 7 to 9 July 2010.

11. Development of the country/subregion food security partnership framework will be a country-led process, focusing on the specific and prioritized food security goals through interventions in all four key areas identified above, with particular attention on enhancing food security investments.[1] Such enhancement may be made possible through increased harmonization and synergy leveraging additional investments within and from outside the partnership. The partners will collectively review their ongoing and planned investment/development assistance portfolio to harmonize operations and seek opportunities to leverage additional investments within and from outside

1 The country food security partnership is expected to include the following elements:
   (i) The government's existing food security strategy and plan;
   (ii) The priority areas where the partnership will focus on when delivering the convergence of both existing and planned three-year lending and nonlending investments, and the convergence of future investments that can be developed to leverage additional investments within the partnership, or from other sources outside the partnership;
   (iii) The measurable indicators of the effectiveness and impacts of the partnership engagement; and
   (iv) The mechanisms by which the government will coordinate, lead, monitor, and evaluate the implementation and review of the country partnership framework.

the partnership, particularly including the private sector.

12. Aside from the implementation of the country food security partnership frameworks, the partners to this Framework agree to regularly hold dialogues on the progress and performance of the overall Framework on an annual basis, with the chairmanship of such dialogues rotating among the partners.

13. The participation of other development agencies as partners is welcome and highly encouraged. A new partner may choose to participate selectively in specific country partnership frameworks. New partners would be expected to indicate their respective commitment to this Framework through the signature of a duly authorized representative. The three current partners would pursue their own internal policies and procedures to integrate new partners in the partnership when that opportunity arises.

14. For close and continuous dialogue among partners to this Framework, the following officials (or such others as may be nominated by their respective institutions) will act as focal points representing their respective institutions.

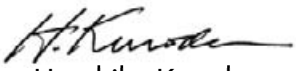
    For ADB: Katsuji Matsunami, Advisor cum Practice Leader (Agriculture, Food Security & Rural Development)

    For FAO: Hiroyuki Konuma, Assistant Director-General and Regional Representative, FAO Regional Office for Asia and the Pacific

    For IFAD: Thomas Elhaut, Director, Asia and the Pacific

15. Other partners which participate in this partnership after this Framework has been signed by ADB, FAO and IFAD are required to nominate their respective focal points upon executing a counterpart of this Framework.

16. Notwithstanding any provision to the contrary in this Framework, this Framework is not intended to create legal binding obligations or relations between the partners hereto.



Haruhiko Kuroda
President
Asian Development Bank

Jacques Diouf
Director General
Food and Agriculture Organization of the United Nations

Kanayo Nwanze
President
International Fund for Agricultural Development

Appendix

Program of the Investment Forum for Food Security in Asia and the Pacific

ADB Headquarters
Manila, Philippines
7–9 July 2010

DAY 1: WEDNESDAY, 7 JULY			
Registration 7:30 – 8:15			
Ribbon Cutting Ceremony: The Marketplace (includes waiting tour of the exhibit area) 8:15 – 9:00 (Cafeteria Hallway)			
Welcome and Opening Remarks 9:00 – 9.30 Zones A – D		Consultations/Business Meetings, 9:00 – 17:00, Annex 1	Marketplace, 9:00 – 17:00, Cafeteria Hallway
KEYNOTE ADDRESS Food For All through Innovative Partnerships 9.30 – 10.30 Zones A – D			
Coffee Break 10:30 – 11:00			
Strategic Investment, Policy and Institutional Innovations for Food Security: India and Bangladesh 11:00 – 13:00 Zones A – D	**PRESS CONFERENCE** **11:30 – 12:30** **Annex Room 1**		
BROWN BAG SEMINAR **Food and Nutrition Security Nexus** 13:00 – 14:00 K-Hub at the Library	LUNCH 13:00 – 14:00 Executive Dining Room		
Strategic Investment, Policy and Institutional Innovations for Food Security: Lao People's Democratic Republic, the Pacific, and People's Republic of China 14:00 – 17:00 Zones A – D			
Coffee Break 16:40 – 17:00			
Session 1: Interactive Discussion with Development Partners 17:00 – 18:30 Zones A – D			
Dinner 18:30 – 20:00 Executive Dining Room			

Plenary Sessions
Parallel Sessions
Breaks
Special Events

DAY 2: THURSDAY, 8 JULY				
Registration 8:00 – 8:30			Consultations/Business Meetings, 9:00 – 17:00, Annex 1	Marketplace, 9:00 – 17:00, Cafeteria Hallway
Session 2: Enhancing Productivity 8:30 – 10:30 Zone A	**Session 3:** Natural Resource Management 8:30 – 10:30 Zone B	**Session 4:** Building Resilience Against Vulnerability 8:30 – 10:30 Zone C		
Coffee Break 10:30 – 11:00				
Session 5: Innovative Financing 11:00 – 13:00 Zone A	**Session 6A:** Connectivity – Solutions from the Private Sector (Smallholders) 11:00 – 13:00 Zone B	**Session 6B:** Connectivity – Solutions from the Private Sector (Corporate) 11:00 – 13:00 Zone C		
BROWN BAG SEMINAR **Environment and Food Security** 13:00 – 14:00 K-Hub at the Library		LUNCH 13:00 – 14:00 Executive Dining Room		
Session 7: Panel Discussion: Fostering Food Security through Regional Cooperation and Integration 14:00 – 15:30 Zones A – D				
Coffee Break 15:30 – 16:00				
Session 7: Panel Discussion: Fostering Food Security through Regional Cooperation and Integration 16:00 – 17:30 Zones A – D				
Session 8: Interactive Discussion with Asian CEOs: Building Partnerships for Food Security in Asia and the Pacific 16:00 – 17:30 Zones A – D				
Session 9: CSO Roundtable – Bringing in the Grassroots Voices: Investments for whom and for what? 17:30 – 18:30 Zones A – D				
Dinner 18:30 – 20:00 Executive Dining Room				

DAY 3: FRIDAY, 9 JULY		
Registration 8:00 – 8:30		
One-on-One Partnership Discussions: India 8:30 – 10:00 Zone B	One-on-One Partnership Discussions: Bangladesh 8:30 – 10:00 Zone B	One-on-One Partnership Discussions: Pacific 8:30 – 10:00 Zone B
Coffee Break 10:30 – 11:00		
One-on-One Partnership Discussions: Lao People's Democratic Republic 10:30 – 12:00 Zone B	One-on-One Partnership Discussions: People's Republic of China 10:30 – 12:00 Zone C	**Civil Society Organizations Dialogue** 10:30 – 12:00 Zone D
LUNCH 12:00 – 14:00 EDR/PDR		
Presentation of Investment Forum Outputs 14:00 – 16:15 Zones A – D		
Closing Remarks 16:15 – 16:45 Zones A – D		
Coffee/Free Time 16:45 – 17:00		

Consultations/Business Meetings, 9:00 – 12:00, Annex 1

Marketplace, 9:00 – 12:00, Cafeteria Hallway

Plenary Sessions

Parallel Sessions

Breaks

Special Events

About the Book

Food security is a critical issue for Asia and the Pacific. The region is the world's key supplier and largest consumer of food yet it is also home to the largest number of the world's poor and hungry. It presents a stark contrast—a food bowl that is full to the brim but cannot feed those who need food the most just to survive. To address food security in a sustainable manner, on 7–9 July 2010, the Asian Development Bank (ADB), Food and Agriculture Organization of the United Nations (FAO), and International Fund for Agricultural Development (IFAD) joined hands to convene the Investment Forum for Food Security in Asia and the Pacific at the ADB headquarters in Manila. This book distills the wealth of information and depth of discussions derived from the proceedings of this landmark forum. With this book, ADB seeks to facilitate the sharing of knowledge, innovations, good practices, and lessons on food security and to catalyze greater interest and action on the issue at every front.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor. Nearly 1.7 billion people in the region live on $2 or less a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance. In 2007, it approved $10.1 billion in loans, $673 million in grant projects, and technical assistance amounting to $243 million.

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