ICIMOD
International Centre for Integrated Mountain Development

Development of Poor Mountain Areas

Editors

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FOREWORD

Poverty alleviation is a target that has been at the forefront of international development efforts since the very beginning of what we may now refer to as the development era. Following the end of the colonial era, it became all too obvious that a number of nations needed extraordinary development inputs in order to ensure that their citizens would be able to fulfill their basic needs - and indeed this realisation grew along with the conceptualisation that the fulfillment of their basic needs is every human beings' right. Within this global perspective, poverty alleviation became the focus of development efforts.

ICIMOD, the first international centre in the field of mountain development, was founded out of widespread recognition of environmental degradation of mountain habitats and the increasing poverty of mountain communities. As such, ICIMOD is concerned with the search for more effective development responses to promote the sustained well-being of mountain people.

It is within this perspective, and in accordance with its mandate to act as a focal point for the mobilisation, conduct, and coordination of applied and problem-solving research activities, that ICIMOD forms and supports linkages that help it disseminate all aspects of knowledge on the Hindu Kush-Himalayan area. Of critical importance are measures to alleviate poverty among the poor of the Hindu Kush-Himalayas.

The experiences in China are enriching to the field and, indeed, reinforced by those insights brought from other areas to this workshop on Poverty Alleviation. ICIMOD is grateful to have had the opportunity to collaborate with the State Council Leading Group for Economic Development of Poor Areas and the Chinese Academy of Science of the People's Republic of China to run this workshop. Many thanks are due to the Ford Foundation for its sponsorship and to their Representative in China, Mr. Nick Menzies, for his help and participation.

This made it possible for the first time in the short history of ICIMOD to bring together scholars and development workers from major mountain regions in the world to interact with those from China's mountain areas.

I am confident that the result of this cross-fertilisation of ideas and experiences is not only a unique volume of excellent articles and scientific treatises but a reference and encouragement for policy-makers and development workers engaged in improving the livelihood of the hundreds of millions of people inhabiting the mountain areas in China and all over the developing world.

Finally I would like to express my sincere gratitude to Mahesh Banskota and Pitamber Sharma for working on the technical aspects of the document. A great deal of effort was expended on their part and thanks are due to them for this.

E. Pelinck
Director General

Editorial Preface

This is a Report on the "International Forum on Development of Poor Mountain Areas", held in Beijing during March 1993. It is divided into three parts. Part One describes the objectives of the workshop, gives an account of the inauguration, and gives a summary of the Workshop presentation and discussions. Part Two of this volume consists of papers that present different mountain development issues and approaches from different mountain regions of the world. It also discusses some of the general problems of poverty measurement and interventions of relevance to mountain development approaches in China. It should be remembered that a key objective behind this workshop was to place before concerned Chinese institutions and policy-makers the overall experience with poverty eradication and mountain development in other areas. Part three focusses on the Chinese experience. It highlights the issues related to the definition and measurement of poverty in China and presents a wide range of reviews regarding field level experience and impact of different poverty-related programmes in mountain areas of China. The papers and reportage on projects clearly show the wealth of experience that has been gained in China regarding poverty reduction. It is probably for the first time that such a rich experience in poverty eradication efforts in China's mountain areas has been brought together in one volume.

In view of the large volume of materials generated for the workshop, ICIMOD has had to devote a good deal of time to bringing this report to a reasonable size without losing the overall substance of the workshop. In the process of finalisation of the workshop proceedings for publication, it has not been possible to consult and discuss each of the papers with their authors. This would have taken an inordinately long time and some discretion has been exercised by ICIMOD in reducing the length of some of the papers. The focus has been on bringing out the main issues raised by the paper. For this purpose, almost all the papers in Part III have been shortened to some extent, while highlighting comprehensive sets of major issues.

The editors are fully aware of the wide range of subjects discussed at the workshop and reported in this volume and care has been taken to ensure that this is adequately reflected. This is a time when poverty eradication and mountain development are both undergoing very fundamental rethinking in terms of better understanding of its complex dimensions and in identifying more effective methods and approaches for better integrating socioeconomic aspects with environmental concerns. This report on the workshop, with its discussion of broader issues as well as those specific to China's experience, provides a rich basis for reexamining alternatives and what might or might not work in the battle against poverty eradication in general and in mountain development more specifically.

Annexes

Glossary

1 US$ =	8.68 *Yuan*		
1 *mu* =	1/6 *acre*	=	1/15 hectare
1 *jin* =	1.33 pounds	=	0.5 kilogramme

Part One

INTRODUCTION

1. Background

Mountain ecosystems are at the centre of the global debate on sustainability and the perceived conflicts between development and environment. This was amply reflected in the MOUNTAIN AGENDA presented during the UNCED (Earth Summit) in Rio, in June 1992. However, equally important is the problem of poverty in mountain regions of the developing world. The various problems encountered in mountain areas have restricted production and exchange options. People's traditional survival strategies, which involve land-extensive, diversified agricultural production systems, have lost their efficacy due to recent changes on the demographic, institutional, environmental, and technological fronts. Poverty and resource degradation have been the consequences.

Against this dominant scenario, there are certain encouraging experiences of successful mountain area development. China has reduced poverty in several mountain areas through well-focussed strategies. To share this experience and to learn from similar initiatives in other areas, this INTERNATIONAL FORUM ON DEVELOPMENT OF POOR MOUNTAIN AREAS was held in Beijing during March (22-27), 1993.

This symposium was jointly sponsored by the State Council Leading Group for Economic Development of Poor Areas, PRC, Chinese Academy of Sciences, the International Centre for Integrated Mountain Development, and the Ford Foundation, who in their respective ways are promoting efforts to alleviate poverty in poor mountain areas.

The meeting was attended by more than fifty experts from China and other countries and focussed on exchange of inter-country experiences, synthesis of key issues in the diagnosis of poverty problems, assessment of anti-poverty measures and the reorientation of development strategies in mountain areas to simultaneously meet the problems of poverty and environmental degradation.

The main objectives of this Forum were:

(a) to facilitate documentation and exchange of anti-poverty programmes in mountain areas;

(b) to identify the major gaps and challenges in the strategies dealing with poverty in mountain areas;

(c) to highlight the specific problems and needs of mountain areas requiring different (mountain-oriented) development strategies; and

(d) to explore possibilities for replicating poverty alleviation SUCCESS STORIES from mountain areas, especially from China.

The key issues covered through papers and discussions during the meeting related to the following.

(a) General issues of poverty in the mountain areas of the developing world; the concepts, indicators of the incidence of poverty and methodologies to capture them; and broad anti-poverty programmes and their lessons.

(b) The role of specific mountain conditions, i.e., inaccessibility, fragility, diversity, etc in making mountain poverty a difficult problem to solve through generalised development interventions designed without a MOUNTAIN PERSPECTIVE.

(c) Synthesis of country experiences in diagnosing the poverty issues and the remedial measures.

(d) Discussions on the above interrelated, broad thematic dimensions of poverty examined questions of the following type.

i) What is specific about the nature and processes of poverty in mountain areas ? Are there specific mountain conditions, needing mountain specific remedies?

ii) How do we perceive the environment-development conflicts and poverty-resource degradation linkages in mountain areas? How rich is our experience in strategies to solve them ?

iii) What kind of relationship exists between mountain and market forces? Do the existing upland-lowland linkages expose the marginality of mountain people and result in over-extraction of mountain resources through market and state interventions ? How much have we cared about harnessing mountain niche and diversity as part of the development strategies for mountain areas? What are the roles of women in mountain areas?

While the bulk of the presentations in the meeting focussed on mountain areas, the relevant experience of other areas, insofar as these were related to poverty and related development issues, was also presented to help derive lessons for practical application.

2. Inaugural Statements

Address by Mr. Chen Junsheng
State Councillor, People's Republic of China

Mr. Chairman, Ladies, Gentlemen, and Comrades, this international conference on the development of poor mountain regions, sponsored by the Chinese Academy of Sciences, the Office of the State Council's Leading Group for Economic Development of Poor Areas of the People's Republic of China, the Ford Foundation, and the International Centre for Integrated Mountain Development has a very practical significance for China, a mountainous developing country. This conference will improve not only the international community's understanding of China's poor mountain areas but also will promote international collaboration on this issue. It is a pleasure for me to be able to attend this conference. On behalf of the Chinese government, please allow me to welcome all the delegates present here and to express my congratulations to all those who have helped to organise this conference. Now I would like to give you a brief introduction to the development of poor mountain areas and efforts that have been made by the government to alleviate poverty in China.

Mr. Chairman, China is a mountainous country. Mountain areas cover about two thirds of the country's total land territory, and counties covered by mountains account for 56 per cent of the total. One third of China's population, 40 per cent of its farmland, and most of its forest and mineral reserves are in mountain areas. These mountains are the sources of most of the major rivers of China and are also the banks for wildlife and plant genes. Mountains constitute a major ecological barrier. Most of China's national minority populations are also concentrated in

mountain areas. The economic progress of mountain areas occupies an essential position in China's overall social and economic development.

After the founding of the People's Republic in 1949, tremendous economic progress has been made in mountain areas. However, compared to plains' and hilly areas, many mountain areas are still quite backwards in terms of both social and economic development. This is due to various natural, geographical, and historical constraints. Nowadays, the bulk of China's poor population is in rural areas, and the majority of the poor rural population is in mountainous regions. There are 18 major poor areas in China, of which 16 are in mountain regions such as the Yi-Meng, Da-Bie, Qin-Ba, Wuling, Jing-Gang, Hengduan, Wu-Meng and Jiu-Wan mountain areas. Of the 699 poor counties listed by the central and provincial governments in 1986, over 500 are in mountain regions. Therefore, it is probably true to say that China's poverty problem is mainly a problem of poor mountain regions. To a large extent, the major issues regarding China's poverty alleviation centre around its mountain areas. The Chinese Government believes that alleviating and finally eliminating poverty in China are critical for the country's political stability, national unity, success of economic reforms, and the nation's long-term balanced economic development. The efforts to alleviate poverty and to bring about development in the mountain areas are therefore very important aspects in China's development strategy.

Starting from the mid-80s, the Chinese Government introduced a well-planned, nation-wide campaign to enhance economic development in poor mountain regions. First, a special agency was set up and policies for helping the poor areas formed. To ensure the smooth implementation of programmes to help the poor areas in the nation, the Leading Group for Economic Development of Poor Areas was set up in 1986 under the State Council. Its responsibilities included the formulation of overall strategy, policies, and guiding principles for helping the poor areas and the coordination, supervision, and management of economic development activities for poor regions. Provinces, autonomous regions, prefectures, and counties involved in poor areas now have similar agencies with full-time staff. A nation-wide institutional system has been established to help the poor areas. At the same time, based on the past experience, the government has also made significant policy changes to help the poor areas. Rather than only provide relief measures to the poor regions the focus has been changed to stimulate economic development in these areas. More specifically, with necessary assistance from the State, the people of the poor areas are encouraged to undertake self-reliant development activities, accumulate resources, and be better able to develop on their own in the future. Relief funds are now provided according to the results of economic programmes rather than on a per capita basis as in the past. In the past, helping mountain areas was the job mainly of the government administration. Now more and more economic organisations are becoming involved. In the past, the provision of a relief fund was the only input to help poor areas, while at present a combination of resources, technologies, materials, and skill enhancement activities are provided to promote poor mountain areas.

Second, special funds and materials are allocated to help the poor regions. Since 1986, the government has granted numerous loans at reduced interest rates for many projects in the poor areas. At

present, the government allocates about five billion RMB *yuan* each year as a special fund to help poor regions. Various kinds of goods, such as fertilisers, plastic film, steel, timber, and trucks, are also allocated by the government each year to support the poor regions. In addition special economic policies, such as reducing or remitting the amount of grains for government purchase and reducing agricultural taxes, have been introduced in these areas. Price decontrol on agricultural products has also been introduced in these areas.

Third, efforts have been made to curb the fast growth of population and to enhance the quality of life in the poor areas. The central and local governments at various levels have formulated policies to reduce population growth. These methods have achieved remarkable results. A large-scale training programme was also launched throughout the entire nation to train farmers and cadres in underdeveloped areas, with the hope of improving their understanding of the cultural, scientific, and technological issues. Through these training programmes, cadres become more competent and learn one or two practical skills to enable themselves to make a better living.

Fourth, people from all walks of life, including government bureaucrats, have been mobilised to help the poor mountain regions. Ever since 1987, the State Council has paid great attention to encouraging the government employees and the people to help poor areas. Government agencies under the State Council have been asked to provide practical help in at least one poor mountain area or county. Eighty-two agencies under the State Council have sent working groups to poor areas throughout the county. The People's Liberation Army, the Party, mass organisations, research institutions, and industries have all participated in this exercise. People in other provinces and autonomous regions have also followed this example.

Fifth, in order to provide improved technical assistance to the poor areas for the development of science and technology (S&T) and to increase scientific and technological inputs in the development of poor areas, the government universities and colleges have set up S & T enterprises in poor areas and provided S & T consultations to local farmers. Governments, at various levels, have sent large numbers of experienced S & T personnel to work in poor areas.

Through the continuous efforts of governments at various levels and the hard work of the people, significant social and economic progress has been made in China's poor areas and the poverty situation has been gradually alleviated. Statistics show that China's poor population in rural areas has decreased from 125 million in 1985 to 85 million in 1990, a 32 per cent reduction. Most of the farmers in poor areas have enough food and can now dress warmly, and this is a significant historical achievement for China.

The last few years have provided us with a series of experiences in the economic development of poor mountain areas and in helping poor farmers. These experiences have been important and useful. Some of these areas in which experiences have been fruitful are as follows.

First, in the last several years, the State has provided the farmers in poor areas with grain, cotton, cloth, and other kinds of industrial products valued at about five billion *yuan* RMB in exchange for their labour in building roads, bridges,

irrigation, and power-generating facilities in the poor areas and also in improving the farmland, maintaining water and soil conservation practices, and providing drinking water for both people and animals. With strong local participation, methods have proved to be very cost effective and economically beneficial.

Second, shortage of food is the most serious problem in all poor areas. To increase food supply, 335 poor mountainous counties in 17 provinces have planted hybrid maize, using plastic film to cover the land. By adopting this method, the average output of grain per *mu* increased from 150 to 200 kilogrammes. This increase in supply of foodgrain has eased the problem of food shortage in many mountain areas.

Third, greater emphasis has been placed on developing high-quality farmland. In the poor mountain regions, very little farmland is available and the yields are quite low and unstable. The State has provided special interest loans to support the building of high quality farmland through improvement in agricultural practices.

Other measures, such as afforestation, conservation of water and soil, improving the ecology, migration of farmers from areas where natural conditions are difficult for human survival, and export of labour from the poor areas, have all contributed to reducing the backward economic conditions of China's poor regions.

China's achievement in developing poor mountain areas and alleviating poverty in some of its rural areas is outstanding. However, it is still a developing country, and the task of eliminating poverty is enormous. China still has a poor population of about 80 million of which 27 million have an average annual income lower than 200 *yuan* RMB. These people still face serious problems in making a living. For almost 60 million people, their living conditions are so fragile that any major natural disaster would push them into extreme poverty. Most of these poverty-stricken populations live in Southwest and Northeast China's mountainous and desert areas. Because of social, economic, and geographic constraints, it is difficult to improve the living conditions of the people, eliminate poverty, and develop the local economies in these poor areas.

The main task for the future is to try to foster a faster pace of social and economic growth in these poor regions. In spite of the difficulties, the Chinese Government will continue to implement its anti-poverty programme in a systematic and well-coordinated manner throughout the whole county. The Government will intensify its funding efforts for anti-poverty. In the 1991-95 Eighth Five-year Plan, the State Council has given high priority to developing poor and remote mountain areas. Specific focus will be on the establishment of basic pillar industries; the development of high-quality farmland, expansion of road networks, development of water resources, promoting education, and establishing public health facilities. These are basic components of development and concern the livelihood of people in poor mountain regions; and thus need to be addressed as soon as possible. The elimination of relative poverty will remain a difficult and long-term task for China.

Mr. Chairman, China's anti-poverty activities have won support and help from other countries and international organisations. On this occasion, I would like to express our sincere thanks to those who have rendered their help. The efforts to develop mountain regions have not only

provided us with alternative approaches but have also identified new goals and tasks. Let's work together and make a new contribution to the elimination of poverty throughout the whole world.

I wish the conference complete success ! Thankyou.

Address by Mr. Nick Menzies, Representative, The Ford Foundation/ Beijing

Mr. Chairman, State Councillor Chen Junsheng, Ladies and Gentlemen, I am honoured to be able to represent the Ford Foundation at this opening ceremony for the International Symposium on Poverty in Mountain Areas which has been organised jointly by the Chinese Academy of Sciences and the International Centre for Integrated Mountain Development (ICIMOD). I would like to thank the organising committee for having invited me and for having given me the opportunity to say a few words about the Foundation's approach to the question of rural development and the persistence of poverty in mountain areas.

The Ford Foundation is a non-profit organisation dedicated to promoting human welfare and the well-being of the most disadvantaged members of society. The Foundation has had the privilege of working together with the Chinese Government and people since 1988 in their struggle to eradicate poverty from those rural areas which are not able to take advantage of the country's reform and opening to the same extent as the coastal provinces and open cities. We have supported the State Council's Leading Group for the Economic Development of Poor Areas, as well as a number of research institutions with a particular interest in the alleviation of poverty, to deepen their understanding of the nature of poverty, to develop some insight into its persistence in some areas of China, and to look for new, more effective ways to address the problem. It has been impressive over the years to see the level of dedication and commitment to this important task from a wide range of institutions, and it is a pleasure to welcome the Chinese Academy of Sciences to this group of institutions.

It is generally recognised that, since China began to formulate and to implement an explicit policy of poverty alleviation in the mid 1980s, there has been a dramatic decrease in the numbers of people identified as living below the poverty line of 200 *yuan* per capita annual income and 250 kg per capita of grain consumed. This achievement cannot be belittled and says much about the importance of a clear national commitment to the objective of eradicating poverty. The Chinese authorities have very deliberately adopted a policy of supporting long-term development efforts in impoverished regions rather than focussing on relief which is, of course, offered through the Ministry of Civil Affairs in emergencies. This strategy has been implemented chiefly in the form of loans and subsidies for agricultural inputs and support for the further development of township and rural enterprises. It is based on the premise that increased agricultural production is the most effective way to resolve the basic needs for food and clothing and that townships and rural enterprises will absorb surplus labour while creating a strong economic base for further development.

The dramatic reduction in the population living below the poverty line has brought a change in the nature of poverty in the last two years or so. Poverty, that used to be a widespread phenomenon which

responded to the kind of interventions I have just described, has become more localised, more persistent, and less responsive to general solutions focussed on increases in productivity. There are indications that the rate at which poverty is being eradicated is slowing, and some observers even suggest that there is a reversal of the trend and a new upsurge in poverty - I should stress that this is a controversial issue, however, and that the statistics do not show clearly whether there has been a slowing or a reversal of the trend. In either case, it is clear though that it is becoming harder to reach the poor, and that poverty alleviation programmes face an ever more difficult task in guaranteeing secure and sustainable livelihoods for the poor.

Whatever the specific numbers on the charts and graphs, all those working on the issue of poverty in China are agreed that the most intractable pockets of poverty in the country are to be found in the northwest and southwest of the country as well as isolated areas scattered in otherwise relatively prosperous counties and provinces. These are mostly mountainous areas, with a relatively high proportion of ethnic minorities in the population and with a long history of being among the most remote and isolated parts of the country. As in many other areas, women are taking on an increasing burden of agricultural work as men move off the farm into wage labour in rural construction or in the new township and village enterprises. The number of female-headed households is increasing, and they tend to be the poorest households in any community.

The northwest suffers from inadequate rainfall and severe soil erosion. The southwest is fragmented topographically and culturally with some thirty ethnic minorities sharing steep mountainsides, degraded hillsides, and dry limestone valleys with the Han majority. Poverty alleviation efforts in these areas will not succeed unless they recognise the special characteristics of the land and the people and are designed to address the specific constraints on development imposed by their physical, social, and economic geography. Uniform programmes to increase production of a limited range of grains, or to promote the development of rural industries unrelated to regional or wider markets, will not work.

This meeting comes then at a critical moment in the formulation of China's strategies for poverty alleviation. It is generally recognised that programmes must shift towards carefully targetted interventions designed to reach the most impoverished groups within society. A glance at the press reports of debates in the National People's Congress currently in session indicates the level of concern throughout Chinese society for the future of agriculture and the increasing recognition that the transformation of rural China depends not only on improved harvests, but also on investments in human capital through education, health, and a greater concern for the environment. These concerns are vital in any rural area. They are even more so in the poorest mountainous regions where the present is made precarious by lack of access to information, where health is constantly threatened and care often unavailable, and where environmental degradation can become devastatingly real as floods or landslides wash away the land, the very basis of farmers' survival.

It is rare that such a distinguished group of experienced scholars and development workers has an opportunity to meet to exchange views on how to address poverty in mountainous areas. I am particularly

pleased that it has been possible to bring together people with a profound understanding of the processes of rural development and of rural poverty with distinguished specialists in the field of mountain development. The different perspectives each participant will bring to the proceedings should ensure that the group discussions will be both stimulating and rewarding. Nobody expects a meeting such as this to conclude with a simple plan of action to eradicate poverty in mountain areas, but by prompting clearer thinking about the opportunities and challenges of the task, I am confident that the direction and the path to be taken will be identified much more clearly than they had been before.

I would like to close my remarks by thanking all those who have dedicated so much of their time over the last year and a half to make this symposium possible. Our hosts, the Chinese Academy of Sciences, have spared no effort in contacting all the participants and coordinating with the various committees to select participants and finalise the agenda. The staff at ICIMOD in Kathmandu has been exceptionally helpful in offering advice and assistance with the logistics and in developing an ambitious but workable programme. We are especially privileged to have the support of the State Council Leading Group on the Economic Development of Poor Areas and State Councillor Chen Junsheng, which will ensure that the discussions at this seminar will be listened to by those directly responsible for defining China's poverty alleviation strategies. Finally, I would like to thank everyone here for having taken the time to attend this meeting and to repeat that the Ford Foundation is honoured to have had the chance to help make such a gathering possible.

3. The Workshop Presentations and Discussions

Overall Poverty and Mountain Development Issues

Part two of this volume brings together the papers that addressed poverty and mountain development issues from the perspectives and experiences of other parts of the world. One of the important objectives of the seminar was to put before Chinese policy-makers and scholars the experiences of other areas with poverty eradication in general and mountain development in particular. It was believed that a comparative review of poverty-related efforts across the region, and even continents, would yield valuable insights for more effective poverty-alleviation measures. The papers presented cover a wide range of areas and efforts, reflecting the enormous diversity of the problem of poverty and mountain development, depending upon the nature of the environment, socioeconomic conditions, and institutional frameworks.

The paper by **Jack Ives** briefly touches upon many different aspects of mountain development. Starting out with a caveat that generalisations are very misleading for mountain areas, a number of points has been made. There is a continuing failure to understand the complexity of mountain areas, both in time and space. Eurocentric views and experiences have been uncritically applied with very little success in introducing meaningful changes. Sustainable development of mountain areas requires a far better understanding of the ongoing biophysical and socioeconomic changes in mountain areas. UNCED Agenda 21, Chapter 13, focusses on mountain areas and this is a major opportunity to work together to mobilise global efforts and resources for the development of mountain areas.

The paper by **N. S. Jodha** highlights the thinking and reflects the nature of ongoing activities for mountain areas at ICIMOD and particularly in the Mountain Farming Systems' Programme. Jodha argues that mountain areas share many characteristics with non-mountain areas that are responsible for perpetuating poverty and hampering efforts to overcome poverty, but these are relatively more severe in mountain areas. Mountain communities adjusted to these conditions through a wide range of lifestyles, agricultural practices, technologies, and socioeconomic organisations in the past. Most of the development thinking and machinery, including development programmes, have not recognised these mountain conditions, limitations, and adaptations of the mountain people. Efforts to build upon local achievements have been lacking and are therefore a major source of weakness in current development programmes in mountain areas. Future development should examine this aspect more carefully and use what is called a mountain perspective framework to determine the nature of appropriate development interventions in mountain areas.

Sharma and Partap discuss the highly interrelated nature of population, poverty, and development in the Hindu Kush-Himalayan mountains. They present some concrete facts on demographic changes in mountain areas. Given the very adverse physical and economic conditions encountered in mountain areas, it is pointed out that greater poverty is a geographical feature of most mountain areas. According to the paper, the demographic scenario in the mountain areas clearly indicates a rapid increase in population pressures and these are for almost similar reasons to those identified for the plains. The economic demographic relationships for mountain areas, however, appear to be more bleak because of the weaker economic base of mountain areas. Many of the development interventions have not satisfactorily addressed the imperatives of rapid population growth, and consequently the efforts made appear to be relatively ineffective on all major fronts - the demographic, the economic, and the environmental. The adverse conditions are further exacerbated by continued poverty in mountain areas. The important measures recommended for the future include more policy and programme sensitivity to local problems, harnessing opportunities in specific areas, encouraging planned migration, and the development of urban centres.

Bandopadhyaya argues that the present misery and poverty of the people of the Himalayas and the degraded mountain environment do not have a direct and unique correlation. Neither is it correct to visualise that the Himalayan ecosystem has exhausted all options for improving the economic condition of the Himalayan people. It is undoubtedly true that, in most parts of the Himalayas, many live in great misery compared to the standard of living in the neighbouring plains. In the past few decades, accessibility into the interior of the Himalayas has increased by the opening of roads and some air routes. This is surely going to multiply the scope of economic activities and utilisation of rich natural resources. However, no institutional reorganisation has accompanied this increased accessibility. The economic processes may, thus, become insensitive to their ecological impacts and cause further ecological and economic degradation. If this has to be reversed, if economic upliftment of the mountain people is to be ensured, and if the rich natural resources are to be managed on a sustainable basis, new institutional measures are needed.

Vineeta Hoon raises similar issues regarding mountain characteristics and emphasises that mountain areas are very distinct from other areas and that there is a need for better understanding of the critical characteristics of mountain areas for more effective poverty reduction. Mountain areas are very fragmented over space and time, giving a wide range of biological and cultural diversity. Survival strategies have focussed on developing strong linkages between different ecozones, as indicated from transhumance and migration practices throughout most mountain areas. Steep slopes, limited topsoil, and short growing seasons result in relatively low levels of land capability, while the rugged terrain of mountain areas limits the development of vital infrastructure. In response to these difficulties, mountain people have developed a strong degree of self-reliance and community spirit in their socioeconomic activities. Many of these characteristics have been overlooked by modern development programmes, reducing their effectiveness. Incorporating these aspects through careful assessment of mountain characteristics would lead to better programme design and implementation. New approaches should focus on understanding the different linkages (physical, biological, socioeconomic, cultural, and institutional) and promote participatory and integrated watershed management approaches in order to reduce poverty in mountain areas.

Christoph Stadel's paper deals with the geographical development scenario of the tropical Andes in terms of the complex environmental conditions as well as in terms of the human factors and cultural landscapes. The reporting is on the research which was based on field investigations carried out in the central Sierra region of Ecuador as well as in the northern Altiplano and the eastern Cordillera region of Bolivia. In the identification of constraints and development problems in the rural regions, the perceptions of the "Campesinos" were emphasised. It is argued that the perceptions of the local population ought to be the foundation for the identification of the problems, needs, and priorities of a region and for sustainable development priorities. There is also widespread recognition among development practitioners that, in any kind of sustainable development, the mobilisation and utilisation of local natural and human resources are crucial. This approach requires a change of attitudes in the direction of giving the local populations a full share in participation, responsibilities, control, and benefits from development initiatives.

Yosuke, Kanji, and Minjin point out the increasing depopulation of rural hill areas because of the limited agricultural land, lack of infrastructure, and difficulties in harnessing improved agricultural technologies. Changes in energy use from wood and charcoal to other forms have also adversely affected incomes from the forests of mountain areas. Reduced income and employment opportunities in villages of hilly and mountain areas of Japan have increased depopulation of these areas. New opportunities for mountain people should focus on promoting recreation-based activities that promote the preservation of natural resources in mountain areas.

Barbara Harris presents some of the general conclusions emerging from a review of many studies on poverty in India and suggests that some of these may provide useful guidelines for poverty studies and poverty-reduction programmes in China. The paper presents the findings regarding the measurement and use of various poverty indicators such as assets,

income, expenditure, mortality, morbidity, malnutrition, vulnerability, autonomy, and entitlement. Some of these indicators are very difficult to quantify and a comprehensive understanding of poverty will require using many of these and many more. The types of indicator needed are determined by the specific nature of the particular area, its biophysical environment, prevalent diseases, market conditions, and the existing socio-institutional set up.

Bajracharya starts by pointing out that close to one-tenth of the world's population lives in the fragile mountains -- most of them, the poorest on earth and neglected victims of environmental degradation, whose livelihood has been threatened in the most serious way. The worst manifestation of this sad state is evident in the very high rates of mortality among infants, children, and mothers. Malnutrition is another serious problem as indicated by a large percentage of children under five whose weight for their age is lower than normal. Access to safe water and adequate sanitation is furthermore limited to only a small number of people. Literacy among adults and school enrollment among children are similarly extremely low.

There is a direct dependence of the people in the mountains on the state of the environment for the maintenance of their livelihood. Clearly, the principal environmental concerns consist of the ever-present threat of disease in the immediate surroundings; the decline in household food security, often related to inadequacies of agricultural practices and loss of fertility in their fields; and the lack of clean water and safe sanitation. Accelerating soil erosion and landslides, as well as rapid loss of habitat and genetic diversity, have become ever more threatening to the sustenance of their livelihood. Alternative opportunities for better livelihood must be found. The importance of people's participation and empowerment for achieving sustainable change cannot be overemphasised.

Bennet highlights the experiences of some countries over the past 10 years regarding financial services' programmes for women and the poor. Many promising agricultural technologies require investments from the farms and increasing opportunities for agro-based micro enterprises also need responsive financial service systems. Providing credit to the poor has been successful in a few cases, but many programmes have failed. Examining both the successes and failures, the important lesson emerging is that it is essential that formal financial intermediation should follow and not precede social intermediation through groups.

Varghese raises some basic questions about development approaches that are relevant for mountain development. She distinguishes between 'genuine' sustainable development (SD) and 'mainstream' sustainable development. Most professional NGOs are committed to mainstream SD which is defined as a concern for establishing ecologically viable models of development without necessarily paying much attention to whether these models are equitable in terms of their class and gender implications. In contrast, genuine SD tries to ensure that models of development also focus attention on redressing gender and class inequalities.

By examining conditions in two *talukas* in the Bharuch District of Gujarat, she describes how the sustainability of the traditional system broke down under social, political, and economic pressures. It looks at efforts made in local development both by the government and those undertaken by an NGO (AKRSP). These development projects have reversed

the ecological degradation and can be considered to be reasonably sustainable in terms of natural resource conditions. However, issues of gender inequality are not addressed and, to some extent, the project's success is precisely because of the neglect of gender issues. However, in order to deal with basic issues of gender and equality, the project would have to begin addressing the prevailing social, economic, political, and cultural issues that are not as easily managed as mobilising for infrastructural development or afforestation. The paper concludes that mainstream sustainable development projects can address practical and immediate development problems but do not address the underlying process (strategic issues) behind these problems.

The Experience of China

The Chinese experience in dealing with poverty and mountain development issues has perhaps been one of the most extensive, both in terms of the spatial coverage and in terms of the variety of approaches that has been pursued. An important objective of the Forum was to share and discuss this experience with and among the Chinese as well as international participants. The Chinese experience, particularly after the economic reforms of 1978, is of great relevance to other mountain areas, as are other international experiences to China.

Part three of this volume brings together the papers presented by Chinese scholars on a variety of themes related to poverty and mountain development. We have grouped the papers into four broad themes: (a) Poverty Classification, (b) Poverty, Development Policy, and Strategy, (c) Approaches to Poverty Alleviation: Area Development and Natural Resources' Management, and (d) Approaches to Poverty Alleviation: Sectoral and Institutional Development. However, and perhaps this is only to be expected, there is considerable overlap in terms of the key conceptual policy and programme concerns.

Since the Seventh Five-year Plan, when the Chinese government officially designated 664 counties as "poor", considerable interest has been generated on the issue of spatial classification of poor areas in China. This interest is reflected in two papers on the first theme of poverty classification.

Xiao Youen et al. attempt to define poor areas on the basis of an objective criterion. They take the county as the smallest appropriate unit in the spatial definition of poor areas and develop a classification based on the three principles of homogeneity in natural conditions, commonality in the structures of consumption, and the integrity of administrative units. Cluster analysis is used to reclassify China's 18 poor areas into three broad classes. A number of indicators reflecting levels of rural production, industrial structure, and income are then used to evaluate a statistical model which provides the parameters to categorise degrees of poverty. Using this criterion and data for 297 poor counties supported by national special purpose loan schemes, the authors show that the rate of coincidence between poor counties, as defined by the objective criterion and as designated by the Government, is 99 per cent.

The second paper by **Jiang Dehua** is more descriptive in nature. Counties are classified in terms of the similarity of physical, social, and economic conditions; the nature of obstacles to economic development; and the perception of the State in terms of policies pursued.

Almost all of the poor areas are hilly and mountainous. A total of six major spatial patterns of poverty areas (namely; (i) the Loess Plateau, (ii) the Border Area between the Eastern Plains and Western mountains, (iii) the Karst mountains of SW China, (iv) the Hills and Mountains of Eastern China, (v) the the Qinghai-Tibetan Plateau, and (vi) Inner Mongolian-Xing Jiang Dry Areas) and 21 sub-patterns are recognised. The factors contributing to poverty and the general development priorities deemed necessary to deal with poverty are then discussed with respect to each of the six pattern and respective sub-pattern areas. The basic argument is to maximise the comparative advantage afforded by diverse mountain conditions.

Policy and strategy issues in dealing with poverty in the Chinese mountains is a theme explored by the second group of papers. The papers range in terms of argument, depth, and empirical base, but the major thrust is abundantly clear, that is, the historical neglect of mountain areas should no longer be allowed to continue because mountain development will not only have a direct bearing on poverty alleviation but also can significantly complement and contribute to China's overall development.

Xiang Nan argues that the major focus of poverty alleviation programmes in China should be on 11 of the 18 designated poor regions situated in western and central-western China. A comprehensive strategy of government, economic, and cultural reforms is called for with emphasis on birth control, efficient and effective use of financial resources, and science and technology. Poor mountain areas of western China have great potentials, and a developed west will benefit both eastern and central China.

Shi Shan's paper posits that the traditional perception, based as it was on foodgrain production, neglected the mountains because these were considered burdens to the national economy. The tremendous potentials of mountain areas are elucidated, and it is argued that these potentials can be exploited only through a comprehensive strategy of planned economic development. Recent policy changes provide a favourable environment for dealing with poverty issues in the mountains.

Ai Yunhang characterises poor mountain areas as resource rich but with poor infrastructure, diverse economies, low level of education, and high population growth rates. The liberal policies pursued by the government since 1979 have many positive features that can motivate development in mountain areas. The major thrust in the future should be towards improving self-sufficiency in foodgrains, diversifying the economy, developing the commodity economy, expanding the service system, manpower development, developing economic links with the outside world, and strengthening leadership at county and local levels.

Yan Ruizheng evaluates the existing economic policies of the Government and concludes that, in spite of efforts made in the past, there are still serious problems in the development of poor mountain areas. Impoverishment and malnutrition are common. The actual population below poverty level far exceeds official figures, and the gap between poor and developed districts has been widening. He argues that the burden of environmental deterioration in mountain areas is a toll exacted in the development of the national economy. The high cost of environmental improvement in mountain areas should therefore be logically borne by the more developed plains' areas, and mountain

development should not be perceived as charity. Policies that need revision for the benefit of mountain areas are suggested. These include changes in government purchases under the planning framework; establishment of special funds for environmental conservation in mountain areas; and preferential revenue, pricing, and tax systems.

Chen Guojie discusses a number of apparent contradictions in the development of poor mountain areas and points out that the increased pace of development could itself exacerbate environmental problems. Also, market reform has meant that mountain products have to face increased competition. Based on past experience, he suggests that the emphasis in mountain development should be on market-oriented products that provide comparative advantages. Efforts need to be made in combining short-term programmes with long-term goals and in the effective mobilisation and efficient utilisation of investment funds.

Dai Sirui presents the theoretical conditions under which internal economic accumulation can increase in mountain areas. He shows that the conventional development dice is loaded against mountain areas, resulting in low levels of internal accumulation and, therefore, investment. While there is a need for the government to adopt preferential policies in mountain areas, these policies by themselves will not yield results unless an accumulation mechanism is set in motion that can absorb and drive internal reinvestment. He suggests that labour exports from the mountains can play a key role in enlarging the source of internal savings and accumulation in mountain areas.

Gao Guan elucidates, through the cases of poor villages in Xing Yuan county in Shandong province, that developed villages have an industrial/occupational structure that is less dependent on agriculture and that industrial development plays a key role in poverty alleviation. Industrial growth in the mountains is inhibited by the lack of infrastructure, manpower, and investment. Policy focus should therefore be on the promotion of agro-based industries that have comparative advantages in the mountains.

The last three papers in this group are concerned with development problems in mountain areas and ensuing policy imperatives. **Benlin Wang**, in a case study of Chaoyang mountainous area in West Liaonong, shows that rapid population growth, low level of literacy, infrastructure, and investment are problems that need priority attention. **Ma Hongyang** argues that both internal and external factors have contributed to poverty in the mountains. In the mountain context of economic development, comprehensive utilisation of natural resources and environmental safeguards must be considered as a social package. In addition to other problems, the impediments to the development of a commodity economy should be removed. In this context the need to ease the marketing bottlenecks through the promotion of market towns is highlighted. **Shi Yulin** shows that the mountainous areas of tropical and sub-tropical China deserve priority emphasis in mountain development, as these areas are richly endowed with resources. The persistence of monoculture has remained one of the main reasons for the underdevelopment of the mountain areas. While agriculture in the valleys needs to be intensified, agricultural diversification with a view to erosion control needs to be emphasised on slope lands.

The third theme, that is, Approaches to Poverty Alleviation in China: Area Development and Natural Resources' Management, is covered by about 10 papers that elucidate a variety of approaches from diverse mountain areas of China. The area-based rural development approach, the watershed management approach, the ecological engineering approach, and an overt focus on science and technology are some of the approaches highlighted by the papers. However, a common thread runs through all successful efforts: mobilisation, use, and participation of local institutions and people.

Li Guiseng describes the biophysical characteristics of the Yan Shan mountains in eastern China and argues that the fragile ecology must be an important consideration in poverty alleviation. Development of small livestock, promotion of the homeyard economy, and establishment of village enterprises should therefore be intrinsic elements of rural development.

The paper by **Menzies** introduces the Rural Poverty and Resources' Programme of the Ford Foundation in China. In addition to enhancing the capacity to analyse poverty and provide the basis for the formulation of more effective policies at different levels, the programme also supported village-level activities to test new approaches to the alleviation of poverty. The Yunnan Uplands Management Programme, under implementation since 1990 through a consortium of government agencies and research institutions, is an innovative attempt at area development and natural resources' management.

The **Project Leading Group**, the provincial arm of the Leading Group for the Economic Development of Poor Areas at the central level, provides an assessment of the Ford-supported Yunnan project. A major departure of the project from conventional approaches was to rely on a "bottom - up" and "from rural household to rural household" approaches. The programme, which is being implemented in some of the poorest regions, relies heavily on participatory methods of investigation and activity planning, on-the-spot demonstration and large-scale training for rural households, and a more decentralised and accountable system of decision-making. The programme has made some significant achievements. The issues of coordination, of a better understanding of the perceptions of rural households, and, above all, participation of women, however, deserve further attention.

Li Tianchi and Yang Wenke, in their paper, elucidate a watershed management approach to poverty alleviation in the context of the Xiaojiang drainage area in Yunnan where deforestation, landslides, and debris flow had reulted in loss of farmland, damage to infrastructure, and impoverishment of the population. Detailed studies on the mechanisms of landslides and debris flows were undertaken. Integrated watershed management projects with reforestation, construction of flow direction dikes, and construction of drainage ditches and checkdams as the major components were undertaken between 1975 and 1990. The socioeconomic and ecological benefits included increase in grain output, rehabilitation of degraded slope lands, and reclamation of wasteland on the lower slopes. This provides an example of how a properly conceived and executed watershed management approach can directly impact on poverty.

The Wangdonggou watershed in the Loess Plateau is known for the seriousness of the soil erosion problem and consequent land degradation, low agricultural production,

low levels of income, and pervasive poverty. In his paper, **Li Yushan** describes the results of the Loess Plateau Comprehensive Management and Agricultural Development Project initiated under the Seventh Five Year Plan. The aim of land development in the Wangdonggou watershed was to enhance productivity and prevent land degradation. The model combines land classification and use with necessary infrastructural development to increase grain yield, develop low class lands and gully slopes, and promote resource conservation as well as the prevention of soil and water loss. The results of the project indicate that the Wangdonggou model provides very effective land management and sustained agricultural development.

Since watershed management appears as one viable way of dealing with poverty, **Wang Lixian et al.** describe the methods through which the quality and efficiency of the information needed for watershed level planning can be enhanced. The structure of a computer-based information data base and its functional characteristics in the planning process are discussed.

Ecological engineering is an innovative and promising approach to promoting complementary economic and ecological benefits in mountain areas and, therefore, in alleviating poverty. **Yun Zhengming et al.** describe the philosophy and approach of ecological engineering in a project in the Taihang mountains that has been under implementation since 1986. Although ecological engineering relates to afforestation, there is a fundamental difference between the two. Traditional afforestation attempts to build an artificial plant community while ecological engineering attempts to build an artificial ecosystem. This approach, first advanced and implemented in the Taihang mountains, is based on differentiation and appraisement engineering of the environment, water and soil accumulation engineering, selection and matching of different populations, time-rhythm engineering, and food-chain engineering. These methods are being experimented on in the Ecological Experiment Station in the Taihang mountains. The results thus far show that this approach is not only responsive to mountain conditions but is also oriented towards poverty alleviation, is cost-effective, and environmentally friendly.

The role of science and technology, although implicit in most of the approaches, is brought out clearly in the paper by **Xu Haiguang et al.** in the case study of the Jun Cheng villages in Tang county, Hebei province. The programme, jointly carried out by the University of Agriculture and the department of agriculture of the county was based on an intensive investigation of the biophysical and socioeconomic conditions. Based on the analysis, improved varieties of wheat, corn, rice, and vegetables were introduced and plantation techniques popularised. Since drought was often the major problem, crop selection and plantation under drought conditions were emphasised. Fruit farming was promoted on sloping lands. Service stations were established for the propagation of new techniques, provision of inputs, and monitoring of activities. Although many problems still remain, the application of science and technology has contributed to a better economy.

Wen Dazhong exemplifies the role of technical assistance in mountain development in a case study of Kazhuo County, Western Liaoning, in the Nuluerhu mountains. This county has been the beneficiary of technical assistance from the Chinese Academy of Science. The

basic objective of the assistance was to develop the local resource potential, improve the ecology, and enhance the capability of developing a commodity economy. A regional development strategy was first worked out consistent with the basic objectives of the assistance. A number of technical studies was conducted and a number of demonstration projects implemented. These focussed on increasing grain productivity and maintenance of the ecological balance. The project objectives over the last 10 years have more or less been achieved. A major lesson from the project was that that it is much more important to give effective technical assistance to increase the self-development capacities of rural mountain communities than financial and material support.

Wang Zhengguo et al. describe the Mountainous Region Development Programme in Hebei province. The approach in the programme has been to look at agriculture, horticulture, animal husbandry, and agro-processing as an integrated development package. Use of natural resources, poverty alleviation, and prevention of natural disaster were taken as the three principles of mountain management. The programme combined projects with short-term and long-term benefits and developed a system of experimental plots, extension, and training which was in tune with the realities of the mountains.

The fourth and final group of papers presented by Chinese scholars relate to agricultural and industrial development approaches, comprehensive and integrated development approaches, and institutional issues with implications for poverty alleviation.

In the context of shortages of grain in the poor mountain areas of China, **Zheng Dahao**, through the application of a production function model, highlights the potentialities and economic benefits of various production systems in the mountains. He shows that the strategy for the development of mountain agriculture has to be based on increasing crop yields per unit of land and simultaneously diverting marginal farmland from cultivation to forestry. A number of policy suggestions are then made for agricultural development in poor mountain areas.

Strategies to increase grain production in the Wulin mountains are discussed by **Hu Guowen et al.** The factors responsible for limiting spring crops in the area included a deteriorating ecology and natural disasters, which made traditional planting practices unreliable. In order to deal with this problem, a "harvesting programme" was introduced with the support of the Chinese Academy of Agricultural Sciences. New seedling and harvesting methods were promoted to avoid the effects of low temperatures as well as other natural disasters. At the same time more effective institutional arrangements were also introduced in tune with economic policy reforms.

The move from poverty and resource degradation to sustainable development is the crux of integrated mountain development. **Liu Yanhua et al.** present a detailed case study of Ningnan County in Sichuan Province and analyse the transformation of a remote, poor county from poverty to relative prosperity. Ningnan County's success in the transformation of its economy was mainly due to the fact that the policies pursued were responsive to mountain specificities, i.e., the imperatives of inaccessibility, fragility, diversity, marginality, and 'niche' or comparative advantage. Policy reforms in the late seventies and eighties allowed for the much-needed flexibility in adjusting

policies to concrete local resource situations. Promotion of science and technology not only helped to increase productivity but also made the move from agriculture to agro-processing possible. Infrastructural developments contributed to the strengthening of local/regional production as well as marketing linkages. Policy reform, however, also had its own share of problems, the most notable was the general neglect in the collective maintenance of community infrastructure. Ningnan, which was predominantly a grain-producing county in the past, now specialises in the production of sugarcane, mulberry, and tung oil, as well as tobacco and subtropical fruits in addition to cereal crops. The agro-processing industrial base has also been strengthened. These developments have directly contributed to poverty alleviation.

The Ningnan experience suggests that any poverty alleviation-cum-development strategy should be local resource centred. Foodgrain self-sufficiency needs to be complemented by the promotion of agro-based industries with comparative advantages. Application of science and technology to suit local situations; complementary infrastructural growth and extension; and collective effort and rational leadership are some of the lessons emerging from the experience of Ningnan.

An industrial development approach to mountain development is presented in the paper by **Zhu Kaihua et al.** in a study of the Daibieshan mountain area. The Daibieshan area has considerable industrial potential in the production and processing of tea, silk yarn, cultivated mushrooms, and white geese. It is suggested that, for speedy development, the management system has to be reformed, basic infrastructure is needed, and the complementarity between industries has to be strengthened.

Zhou Zhixiong et al. discuss the problem of the selection of an appropriate industrial structure model for mountain areas. They maintain that industrialisation in the mountains should be based on the comparative advantages of resources, advantages of insularity, climatic conditions, and cheap labour. The first model of industrial development in the mountains is based on mineral resource extraction and processing. The second model is based on environmental regeneration and planting. However, given commensurate developments in infrastructure and investment, the authors opine that it is the second model that is more appropriate for mountain areas.

The last two papers in this group relate to the institutional aspects of dealing with poverty in the Chinese context. **Wu Guoban** discusses the usefulness of township and village cadres who are the ones required to take the lead in implementing programmes to alleviate poverty. He shows that, following policy reforms, the township and village cadres no longer wield as much influence as they used to in the past, although their role is still quite important. The function of cadres is to maximise the task accomplishment index as well as economic and social development and ensure the chances of promotion. In reality, however, the cadres tend to attend to tasks assigned by higher ups which may not always be consistent with local needs. It is, therefore, necessary to assign a higher weight to the indicators of local economic development if the cadres are to be motivated to facilitate local development work, including work related to poverty alleviation.

Liu Wenpu looks at the efficacy and effectiveness of village organisations through a case study in Shaanxi Province. He shows that, following reforms, village organisations no longer play a pivotal role

in the organisation and distribution of production in the collective economy. This function has now been given to the household. Village organisations now have been transformed into autonomous village committees, but they are still important as the base of rural power structure. In the past there was an actual cadre class. Now cadres are more concerned about their household economy because they cannot rely on allowances provided by the State. Village organisation has become more autonomous. Cadres no longer function as agents of the State and, in fact, tend often to side with farmers in instances of conflict between policy and farmers' interests. While this may be a positive change in some respects, it nonetheless hinders the implementation of government policies at village and household levels.

Group Discussions and Presentations

Following the presentation of papers, participants were grouped to discuss specific issues raised by different authors. The first group focussed on poverty in the mountains and its specific remedies. The second group discussed the conflicts between environment and development in mountain areas and the third group examined the issue of Market Driven Transformation and Processes and the Mountains.

(a) Poverty in the Mountains and its Specific Remedies. In order to understand the specific dimensions of poverty, there is a need for a clear definition of poverty. In the case of mountain areas there are two aspects that appear to be important. First is the question of access to food, clothes, shelter, and, in general, to a better quality of life. Second are the issues of security, vulnerability, dependability, and the nature of choices and options that are available for improving critical aspects of the quality of life. Efforts must be made to carefully develop the understanding of these components through scientific measurements and monitoring over time. At the present work in this direction is very limited.

Poverty experienced and observed in mountain areas differs from what has been seen in non-mountainous areas in terms of security and options and the processes responsible for this.

The experience of China in poverty eradication is unique, with its strong initial focus on providing food, clothes, and shelter for all the people. This was followed by identification of poverty pockets requiring special focus. In general, strong efforts were made to address directly poverty-generating factors such as the distribution of the resource base and its productive utilisation. China, over the years, has made one of the most impressive gains in the battle against poverty and, despite these significant achievements, mountain areas still remain one of the poorest in the country. Recently, increased attention has been directed towards mountain areas. While the pre-1978 efforts focussed on providing only relief support to mountain areas without addressing the fundamental factors behind the poverty of mountain areas, the post 1978 period concentrated on enhancing productivity. The full impact of these efforts is being seen slowly and local capabilities to sustain rapid economic expansion have become fairly apparent. The special roles played by the Leading Group in this war against poverty have been very significant and will remain important in the future also.

The experience of India in terms of the approaches used and the results achieved so far is very instructive. Absolute poverty is greater in India than in China. Analysis of Indian poverty has provided insights into the role of policies. Anti-poverty strategy in India has also moved from a disaster-relief programme to the use of comprehensive, integrated rural development approaches. In spite of the very strong commitment of the Government to providing services for the poor, there are numerous leakages in the delivery systems that have prevented a greater flow of resources to poorer groups. The poorer groups still remain very vulnerable to manipulation and control by more powerful interest groups.

Despite greater absolute poverty in India, the people in the mountain areas appear to be relatively better off in India than in China. Reasons for this appear to be better linkages between the mountains and the plains, stronger local capabilities, and greater diversification of economic activities.

Based upon discussions on the experience of India, China, and other areas, regarding poverty eradication, the group emphasised the following:

i) building local capabilities in terms of skills, bargaining, management, etc for both individuals and institutions;

ii) promoting stronger upland-lowland linkages (physical, market, and others) - for moving development beyond food self sufficiency and basing it on comparative advantage;

iii) closer monitoring of poverty in order to provide guidelines for improving the effectiveness of different policies and programmes; and

iv) to be alert about the possible negative role of the market so that mountain people are not exploited and the mountain environment is not degraded in the name of development.

(b) Environment Development Conflicts in Mountain Areas. It became quickly apparent in the workshop that there were quite wide differences in experience and intellectual approach to mountain problems, even to the point of different definitions for key terms. The workshop also highlighted a number of case studies of successful mountain development projects that were presented by Chinese scholars and planners.

Mountain poverty and the environmental linkages facing China were so vast and complex that firm conclusions and specific policy, or strategy, recommendations were very difficult without referring to specific problems or areas. Nevertheless, there was consensus on a number of important generalisations that could contribute to the success of this international forum by enhancing its usefulness for the mountain areas of China.

First, it was agreed that there is an urgent need to recognise that a special Mountain Perspective is justified and is required for the success of any national or regional policy aimed at breaking the poverty-environmental degradation circle of mountain regions. This perspective, or

viewpoint, is based upon the fundamental geographical factors of the mountain regions: relative isolation (this is an accessibility question); steep slopes, great range of altitude, poor and unstable soils, and an infinite variety of micro-environments. These represent the biophysical characteristics. There are also other factors such as ethnic and cultural diversity, history of human adaptations in mountain environments, and extent of separation of specific communities from the mainstream of national life and economic development processes. It was recognised that, in many parts of the world, mountain development projects have failed, or have fallen short of objectives, because these characteristics were not considered.

It was recommended that, to break the vicious circle of poverty-mountain environmental degradation, a special "law" of development for the mountains must be developed. Mountain regions and mountain people had many positive attributes - generations of accumulated, indigenous environmental knowledge; rich biological and cultural diversity and richness; and hydro-electric power potential, among others. These attributes had to be recognised and incorporated as part of any development strategy. At the same time, they were attributes that must be protected: the biophysical and cultural diversities of mountain regions were vulnerable to rapid degradation if not recognised and protected at all levels. They could add greatly to the prospects for poverty eradication and sustainable development. It was recommended that the relevant principles, enunciated in Agenda 21, Chapter 13 of UNCED, be adopted in this context.

It was recognised that there was a critically important gender issue. Numerous examples were available throughout the mountain development world whereby projects of good intention and considerable sensitivity unwittingly increased the burden carried by women, thereby putting at risk the sustainability of the specific project. More than half the mountain farmers were women. In many mountain societies, women undertook more work than men without taking into account the additional domestic tasks and the burden of child-bearing and child care. Off-farm wage opportunities frequently isolated the wife as the effective single head of the household. It was recommended, therefore, that the role of women be fully assessed and the potential effects of any development strategy on the well-being of women be evaluated prior to the implementation of development activities. It was essential to ascertain the perspectives and values of women in development strategies and to support these with concrete programmes.

Following these general points and recommendations, some more specific suggestions were proposed.

(1) Two types of development strategy should be recognised.

   (a) Development for the short-term production needs of farmers in mountain regions (especially provision of minimum food, clothing, and shelter - the basic needs).

(b) Development for long-term objectives; these would usually entail large-scale construction (roads, muring, hydro-electric development, and reforestation) and should be set up in such a way as to provide benefits to the local people as well as to meet national priorities. There would be the added need for compromise and conflict reduction. This relates to the stated need for a "law-of-the mountains".

(2) Unremitting efforts should be made internationally to reduce and eventually eliminate all forms of warfare which today were still heavily concentrated in mountain border regions. This included not only conventional warfare, but also civil strife, border tensions, and maintenance of heavy military presences in culturally and environmentally fragile mountain border regions. Measures to curtail the illicit drug trade should be undertaken.

(3) Further development of environmental and cultural impact assessments was recommended.

(4) Because of the stated extreme complexity of the mountain habitat, more research was needed into the natural and human sciences in mountain areas.

(5) An international endeavour was needed to accelerate the transfer of knowledge and experience derived from increased mountain research and from local and regional developments. This would follow the recommendations of UNCED Agenda 21, Chapter 13.

(6) Considerations should be given, where appropriate, to the establishment of international or joint national borders, parks, and reserves (parks for peace and environmental sustainability). Such parks in regions traditionally used by mountain communities should have management policies that were advantageous to the indigenous mountain communities.

(7) While there had been great progress in the reduction of poverty in mountain regions, as demonstrated by the Government and the Peoples' Republic of China, the fact was that there still remained widespread poverty in mountain areas of the PRC and elsewhere. Therefore, it was recommended that such an International Forum on Development of Poor Mountain Areas be repeated at two-or three-year intervals to share and exchange relevant experiences and interventions.

(c) Market-driven Transformation Processes and the Mountains. The main focus of the discussion was on the question of "marginality" of mountain areas and people. This is a term which has confusing implications, especially when translated from English to Chinese. The first part of the discussion was, therefore, devoted to what the term meant. There was broad agreement that the process of

marginalisation had three principal elements.

(1) **Politically** it implies that the people who are marginalised are deprived of any control in the decision-making process. Decisions are imposed upon them, irrespective of their good intentions or bad intentions.

(2) **Economically** it implies that the benefits mostly accrue to those who impose the decisions and those who are marginalised have little or no part in the process of bargaining.

(3) **Socioculturally** it implies that the position in society of a minority, or poor person, more often than not, excludes them from the possibility of having a say in political or economic decisions.

The general impressions about markets, as conveyed by the participants from China, were that the market economy was perceived more optimistically as a necessary condition for economic growth and that the benefits outweighed the adverse effects, at least initially. On the other hand, the participants from outside China were more wary of the market economy, especially in the light of the distortions in the market that make the poor and the vulnerable the ultimate losers. This had happened in the past on account of the emergence of local monopoly; the predominance of interlocking contracts; the tendency towards greater indebtedness, caused by forced/covered commercialisation; the absence of compensation for adverse effects caused by long lags in the course of payment transactions; and the prevalence of fraudulent and criminal behaviour.

Regarding the evidence from mountain areas concerning the beneficial as well as adverse effects of the market economy and the measures that would help mountain areas take advantage of the opportunities presented by the market economy and, at the same time, protect the vulnerables, a number of points was raised.

Regarding the beneficial effects of the market economy, the following points were raised.

- Constraints to diversified use of local resources are overcome.
- Greater efficiency in production activities.
- Migration to areas with greater opportunities. Also helps reduce population pressure in areas experiencing resource limitations.
- Increased acceptance of new ideas.
- Creates favourable conditions for decentralisation.
- Greater opportunities for human resource development due to increased infrastructure.

Regarding the adverse effects of the market economy, the following points were noted.

- Safety net for the vulnerable in jeopardy because of the difficulties in finding initial seed funds and the lack of access of the poor to subsidy. There is a real danger of increasing inequity and this tends to worsen because of the reduced bargaining power of the poor.
- Urban areas become more attractive, resulting in capital flight and brain-

drain, from rural areas. There is uncontrolled growth of urban areas and, over time, there is greater disparity between urban and rural areas.

- Degradation of the resource base increases on account of market-induced over-extraction and self-interest.
- Provision of basic services is generally curtailed with the increasing role of the market and privatisation of these services.

Measures proposed include the following insofar as the role of the State is concerned.

- Policies/laws to regulate distortions in market mechanisms.
- Investment in human resources' development (education, skills, and management capabilities, etc).
- Expanded safety net for the vulnerable (child care centres, health care, etc).
- Greater flow of resources, input services to villages (as opposed to county seats, urban centres).

Regarding local initiatives, it is essential to

- develop farmers' cooperatives for production activities/market in outlets,
- provide protection from powerful outside forces, e.g., middle men,
- provide protection from risks, uncertainties of the market economy (e.g., price fluctuations), and risk sharing,
- take advantage of opportunities and technologies,
- provide technologies and other inputs,
- exploit the comparative advantages in the mountains in a sustainable manner, and
- influence political/economic decision-making.

Closing Summary[1]

I think that everyone will agree that the three rapporteurs have done an excellent job of summarising the content of Thursday's group discussions as well as putting forward some concrete recommendations regarding poverty alleviation in mountain areas. I would like to thank them all for the care with which they have approached their task, and I hope that their reports will be made available to a wider audience than the participants in this meeting.

I do not intend, at this point, to provide a further summary of the preceding summaries. Instead, I would like to review two concepts that have frequently been referred to during this symposium, and which have caused some confusion or even misunderstanding. They are however central to the purpose of the symposium, and so I would like to talk briefly about them with some illustrations, which I hope will make the concepts more concrete and indicate why they are so critical to the task of eliminating poverty in mountain areas.

[1] By Nick Menzies, Representative The Ford Foundation, Beijing

The two concepts are: 'Science and Technology' and 'Marginality'. The former may seem to be rather obvious without any need for clarification, but I believe that we ought to be very cautious in the role we assign to science and technology in poverty alleviation. 'Marginality' is a concept that is commonly used in research and discussion about mountain areas, but it was clear during this meeting that the meaning and the practical relevance of the concept were not at all clear to many participants.

Science and Technology. Many presentations at this symposium referred to the importance of introducing science and technology to impoverished mountainous areas as a means of poverty alleviation. Many of the presentations also showed the tremendous contribution scientists can make by making their skills and knowledge available to the people in poor counties. In areas that are characterised by lack of access to education and sources of information, science and technology can be powerful tools to break out of the long-standing patterns of production and deprivation which contribute to poverty.

Science and technology are not, however, absolute values. They are only tools to address problems, not the answers to the problems. There is rarely, if ever, just one solution to a problem. Scientific analysis can be used to identify a range of technical solutions to a problem, but different analyses will offer different solutions, all of them 'scientific'.

I have frequently found myself in rural areas discussing this issue with local and provincial personnel. The point is quite easily illustrated: Take any piece of land, let us say a steeply sloping area of 'wasteland' in a mountain community. What is the best, 'scientific' use for that land ? If I turn to an agronomist, he or she would probably recommend terracing the land and turning it into high-yielding grain fields. A livestock specialist, on the other hand, would recommend enriching the grass cover with some clover and other forage species and using it for grazing. A forester would suggest planting trees, perhaps for fuelwood and timber. Each one of those specialists is looking at the land and analysing its potential in a rigourously scientific manner. Each one of them, however, comes up with a completely different solution, most of which are quite incompatible And a local farmer would probably have yet another idea - equally rational according to the needs and capacities of that farmer.

Science and technology, then, are tools with which to identify a range of solutions, but they are not, in themselves, solutions. It is important, too, to remember that different solutions will have different impacts on different people. I refer here to an Indian forester, Dr. N. C. Saxena, who recently participated in a meeting on community forestry which I also attended. Dr. Saxena was making a plea for more technical research in social and community forestry, but his point was that research is needed to identify technical interventions that benefit the poor in particular. "Science and technology", he said, "are not neutral. We can and must design technologies that respond to the needs of the poor and landless." I hope that this can be kept in mind in the context of poverty alleviation in mountainous areas. We must remember at all times to ask the question. "Who is going to benefit from this particular technology ?" The objective is to find technologies with which the answer will clearly be "The poor will benefit".

Marginality. The issue of 'which science and technology' is not peculiar to mountain

areas. The second issue, about which I would like to make some comments, is, however, particularly significant in mountain areas. In fact, in this symposium, most of the speakers from outside China have referred to 'marginality' as one of the characteristics of mountain areas.

Dr. Bajracharya, in his report, defined the concept of marginality. I will not repeat his definition here, but I would like to use the example of a mountain community in China to show why the concept is more than just an interesting abstraction, and how marginality can lead not just to the persistence of poverty but also to the impoverishment of an area which should be relatively prosperous.

The community is located in northern Yunnan Province on the shores of Lugu Lake. The hills surrounding the lake were formerly densely forested. The forests were almost entirely cleared by the provincial forestry bureau in the 1970s, after which the area was declared a 'Protected Natural Area'. The population is made up of four ethnic groups, the *Mosuo*, the *Pumi*, the *Yi*, and a few *Han* households.

Dr. Bajracharya referred in his presentation to Economic Marginality, and Political Marginality. I will give examples of these and will add Cultural Marginality, which may at first sight appear to be even more abstract, but which is also a critical factor causing impoverishment. I would like to emphasise at this point that my intention in discussing this example is not to single out one area of China for criticism. Similar examples can be found in almost every country in the world. My purpose is to use an example with which many of the participants in this symposium will be familiar to point out that marginality is not just an academic concept but that it translates directly into the lives and livelihoods of mountain communities.

(a) **Political Marginality.** I have mentioned that, in the 1970s, the provincial forestry department harvested most of the timber from the hills surrounding Lugu Hu. At no time in the process were the local inhabitants consulted about the cutting. The decision was made in the provincial capital, some five or six hundred kiloimetres away - or maybe even in the national capital. The local people suffered the consequences in terms of landslides and soil erosion, but they received no more than wages for the labour they provided to log the trees (the logging trucks were driven by department staff from outside the area). The decision to declare a protected natural area was taken, again, in the provincial capital. The first thing local people knew about it was when a Preserve Headquarters' was built and staff brought in from outside to tell them that they could no longer cut or remove any wood from what was left of the forest. Over the years, the community and the preserve have begun to work out a form of cooperation, but now there is a new threat, again from the outside. The provincial tourist bureau has noticed the natural beauty of the area and has decided to create a 'tourist base' in the area. Small locally-owned and managed guest houses, which now bring extra income directly to villagers, will be replaced by large hotels run and managed by the tourist bureau. Again, the first thing the local community knew about this new development was when they saw surveyors sent by the tourist bureau cutting down trees (which local people are prohibited from doing) to survey and identify potential 'tourist sites'.

The link between political marginality and impoverishment here is that, in each case, decisions were taken by agencies located a long way from the community which have had the effect of destroying critical resources and of depriving the mountain community of sources of income. Being politically marginalised, the mountain community has had no way of making its voice heard to affect these decisions and to ensure that there is some consideration of their interests.

(b) **Economic Marginality**. Economic marginality flows from the political marginality described above. The bulk of the profits from logging did not flow to the communities surrounding Lugu Hu. Tourist development may well show the same pattern.

The situation around Lugu Hu also shows another aspect of economic marginality: mountain economies often depend on a relatively low level of resource utilisation. Local economic systems may often be swept aside or destroyed in favour of activities that are considered to be more productive from the perspective of wider regional economies. Fishing used to be one of the major sources of livelihood for the *Mosuo* and *Pumi* people around Lugu Hu. Some years ago, Sichuan Province built a hydroelectric facility at the mouth of the river which drains out of the lake. The fish in the lake breed downstream and are now blocked from returning upstream to the lake. The Lugu Hu fisheries have collapsed in less than a decade.

A case can certainly be made that the overall benefits to society of the hydroelectric facility outweigh the loss of the economically marginal fishery on the lake. At the very least, however, there should be recognition of what has been lost and some form of compensation made available to those who have lost it. Economic marginality has led to relative impoverishment of the mountain community.

(c) **Cultural Marginality**. The cultural marginality of mountain communities is obvious from the many observations concerning the different customs of minority people, many of which are sometimes designated as 'backward' or even 'primitive'. I would just like to raise two issues which indicate how lack of understanding and appreciation of cultural differences and diversity can also lead to impoverishment and unintended consequences of development efforts.

Cultural marginality can be a phenomenon that distinguishes whole communities or ethnic groups, but it is also found within a community where certain groups are simply ignored or excluded from some activities.

Within the community, one of the most commonly marginalised groups with respect to development activities is women. Lugu Hu is no exception. Traditionally, inheritan-ce of property among the *Mosuo* and the *Pumi* is through the female line. Land-use rights, however, have been allocated to male 'heads of household'. With the exception of ploughing, most agricultural tasks are carried out by women, yet the few extension programmes that exist in this area are directed towards male 'heads of households'. Sadly, such examples have been described so often in the

international literature on rural development that I do not need to go into further detail about the consequences of the cultural marginalisation of women in rural development.

It may be less obvious how cultural marginalisation of whole ethnic groups might lead to impoverishment, but, once again, Lugu Hu offers some concrete examples. The first I will point to concerns religious beliefs. The *Mosuo* and the *Pumi* are devout Lama Buddhists. For centuries, they have protected certain hills and mountains as sacred forests, which they refer to as 'the abode of the Boddhisattvas'. Within Chinese society, as a whole, such religious beliefs are considered to be backward and strenuous efforts have been made at various times in the past to change them. On several occasions, the sacred forests have been deliberately cleared - leading to severe problems from landslides and erosion and the destruction of important grain crops.

One speaker on Tuesday referred to the *Mosuo* as having a 'backward matriarchal form of society'. This is not the place for a deep anthropological discussion about whether or not *Mosuo* society is truly matriarchal, but it is certainly 'culturally marginal' within the context of China as a whole, and it is worth noting how the conflict between a traditional social structure and the norms of the majority can also lead to impoverishment.

An essential feature of *Mosuo* society is that, while adult men and women form stable couples, they both stay in their respective mothers' household even after the birth of a child. In this way, the household's land is never divided, avoiding fragmentation of landholdings over time. This social structure is in fact a very effective adaptation to the scarcity of arable land which is a critical constraint on survival in many mountain areas. It is important to note that, on the shores of Lugu Hu, the most impoverished farmers are the *Han* households who still divide their land generation after generation, unlike their *Mosuo* and *Pumi* neighbours.

I raise this topic here because the lack of understanding of *Mosuo* and *Pumi* society, which is the result of their cultural marginalisation, has led to frequent calls to 'modernise' their 'backward' customs. Culture and custom are very complex and extreme caution is needed before trying to transform culturally marginal people into a model that is more easily recognised by the centre.

The examples above could be repeated in any number of different mountainous regions in any number of different countries. They serve to explain, however, why many participants at this forum have placed so much emphasis on understanding poor people and their perceptions. Without the active support of the people in mountain communities, development activities cannot be sustained in the long term. China is unfortunately no exception to the long list of countries in which many development projects have collapsed as soon as the specialists and the experts left.

What is needed are programmes and technologies that respond to the needs and capacities of farmers. The

difficulty of identifying animplementing these programmes is compounded in mountain areas by the political, economic, and cultural marginality of mountain people. I believe, though, that this meeting has gone a long way to finding ways of addressing hese problems. The key to doing so is to ask who will benefit. I would like to end with a plea to all the participants in this forum that we all remember, all of the time, that mountain environments may limit the strategies and options for survival, but the poor are people, not pieces of land or production statistics.

Part TWO

Poverty and Mountain Development - An Overview

SUSTAINABLE DEVELOPMENT IN POOR MOUNTAIN AREAS: THE LESSONS LEARNED FROM THE UNCED EARTH SUMMIT, RIO DE JANEIRO, AGENDA 21, CHAPTER 13

Jack D. Ives

I would like to open by expressing my appreciation and warmest regards to our host institutions.

The topic of this International Forum is one of the most pressing problems facing the entire world community. The poor are unfortunately becoming a majority. To assist them in striving to satisfy their aspirations for a better life, to me, is the centre of THE task for effective social and environmental survival in the 21st century. In this sense alone UNCED has laid an important foundation, if only to demonstrate the magnitude of the task and the extent of the disagreement over how to proceed.

My background and training is in geomorphology, glaciology, and permafrost. For many years, I had the privilege of indulging in studies of the history of the last glaciation in the Canadian Arctic and Subarctic, far removed from human beings. So you might well ask what I am doing at such an international conference on development of poor mountain areas ?

Since 1978, I have worked with the United Nations University as coordinator of what is now called its programme on Mountain Ecology and Sustainable Development. In conjunction with my close colleague, Professor Bruno Messerli, this programme has engaged in a modest amount of research in N. Thailand, the Himalayas, Yunnan, Tajikistan, Ecuador, Chile, Kenya, and Ethiopia, as well as the Swiss Alps and the Colorado Rockies. We have also held quite a few workshops and conferences and published some of the proceedings - mainly in the journal Mountain Research and Development.

Because of this and because of the presentations made this morning, I think it may assist our deliberations best if I share with you a few personal observations and experiences rather than read a more traditional paper.

I risk introducing a confusing array of separate issues. If you bear with me I may be able to show that they are connected.

First, mountains are not necessarily fragile - it depends on our definition, but it is also a question of the fragility of what people do in the mountains. This is a way of saying that we must try to understand better than we do the physical dynamics of mountains and how human activities accentuate these processes or diminish them. Without a fuller understanding, interventions, such as the imposition of infrastructure, can be disastrous.

This reinforces the point made that - development programmes have too often regarded mountains as the adjuncts of two-dimensional plains-oriented projects and have ignored the three dimensional character of the mountains. Let me proceed, therefore, with a series of specific points.

1. We have too many examples of disastrous outside interventions - high dams in the Himalayas that silt up very rapidly (due to natural processes, not necessarily human ones) and risk catastrophic collapse - perhaps we should think about the full implications of the Tehri Dam in the Garwhal Himalayas. Other examples could be chosen from Ecuador, Haiti, and elsewhere.

2. At the other extreme, we should examine the excellently sensitive performance of the Aga Khan Rural Development Project in North Pakistan - small scale, village-chosen practical projects accompanied by encouragement for local bank savings schemes. But these have also marginalised the women in the village who only speak their local minority language, and this needs to change.

3. The question of policies to reduce the dangerously accelerating population growth. This is surely a key figure and in this we must express our admiration for the Chinese Government's courageous efforts. Yet think of the minority woman who has two girls (daughters) and now finds she will be restricted to one male child. She knows that if she is to keep her husband from deserting her she cannot risk giving birth to a third female, so she must abort every successive pregnancy. This is unwise expenditure of energy, to say the least.

4. In 1987 and 1991 I was able to make extensive journeys into Tajikistan. The people were magnificent, hospitable, and apparently well fed. We began an ambitious UNU-Russian/Tajik Academy project. One of my students was shot last autumn and after last September approximately 25,000 Tajiks have died in a little publicised civil war. Events of this nature raised serious questions about sustainable development in the Pamirs.

Some Generalisations

1. For mountain areas, generalisation, if not absolutely impossible, is highly misleading.

2. We must continue to challenge attractive but unproven assumptions

   as an example, the widely-accepted notion that the flooding of Bangladesh and Gangetic India is due to deforestation (post-1950) of the Himalayas.

3. The demographics of mountain communities must be better understood.

4. The role of women in poor mountain societies is critical to sustainable development and greater efforts are needed to address their problems.

5. The embarrassing issue of warfare in all its forms, plus border conflicts and national rivalries, is one of the most devastating deterrents to sustainable mountain development. This is the ultimate immorality.

6. The population growth issue must be resolved.

7. National superiority is an anachronism. An example is the widespread criticism within North America of Chinese human rights' performance. In my personal experience, in many of the mountain border provinces of China, especially in the North West and South West, I have been very impressed with the sense of cooperation and geniality. I have also been impressed with the tremendous progress made in improving minority peoples' living standards since my first visit from 1980 onwards.

It is important that these impressive achievements are better publicised within the industrialised countries.

In Rio de Janerio (UNCED), 170 national delegations provided a mandate for the mountains of the world by supporting the following two programmes.

1. To generate and strengthen knowledge about the ecology and sustainable development of mountain ecosystems.

2. To promote integrated watershed development and alternative livelihood opportunities.

These two points are excellent, but they must be converted into practice. We need to be able to share experiences from all over the mountain world - this conference is a step in that direction.

We also need to realise that the poorest men and women of rural mountain regions are equal to us as human beings and have an enormous accumulation of indigenous mountain wisdom and knowledge to offer to us. As a colleague of mine, Michael Thompson, mentioned a few years ago, what we need is not CHARITY for the mountain people but GIFT EXCHANGE.

PERSPECTIVES ON POVERTY GENERATING PROCESSES IN MOUNTAIN AREAS

N.S. Jodha[1]

Introduction

This paper discusses the dynamics of poverty and poverty removal in mountain (and hill) areas with reference to these conditions. The paper discusses the implications of mountain specificities vis a vis the factors and processes which are central to economic development and the welfare of the people. The paper discusses the issues central to the poverty and anti-poverty processes in a mountain context and not quantified dimensions of poverty and inter-class or inter-personal inequity aspects. Furthermore, it presents the synthesis of understanding generated through past and ongoing studies. It draws heavily on the past write-ups based on the above studies (Jodha et al. 1992, Jodha 1991, Jodha 1990).

Mountain Habitats and Dominant Characteristics

The important conditions characterising mountain habitats, which separate them from the plains, include inaccessibility, fragility, marginality, diversity, and niche (Jodha 1990, 1992). In this section their implications for poverty alleviation in mountain areas are briefly discussed.

Inaccessibility, a product of the altitude and terrain of mountain areas (Hewitt 1988) obstructs mobility, leads to higher costs of transport for development interventions, imposes isolation and restricts the scope for higher productivity of resources through enhanced use - intensity, higher use of inputs, and resource upgrading, as these changes crucially depend on mobility and external linkages. The sustainability of human welfare or survival, under such conditions, is closely associated with local resource-centred diversification of activities and a focus on the regeneration, protection, and recycling of resources and products, as well as collective sharing systems. The socioeconomic dimension of inaccessibility also means people's limited access to the gains from development of mainstream economies as well as decision-makers' information gaps vis a vis mountain habitats.

Fragility, a product of verticality, steep slopes, and other associated biophysical conditions, makes mountain areas most vulnerable to degradation, even with a little disturbance (DESFIL 1988). Fragility not only prevents the higher intensity of land use, but also limits both physical and economic scope for input use. Fragility appears to be the

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most constraining factor in land use for high productivity through high-use intensity in mountain areas. The resource-use options in the context of fragility need to focus on: land-extensive systems; a combination of productivity and protection measures; resource upgrading using nature's own processes (e.g., use of soil building/binding plants); and intensification as permitted by adaptations of resource characteristics (e.g., terracing steep slopes before using them for cropping).

Marginality, like other mountain characteristics discussed here, has both biophysical and socioeconomic dimensions. It is a product of both natural and man-made factors (Blaikie and Brookfield 1987). Marginality shares most of the implications of fragility: limited and low payoff options, and the high cost of upgrading resources, make the marginality of resources and people a major constraint to sustainable resource use for high productivity and poverty alleviation. Accordingly, a dependence on nature's processes (including regeneration), diversification, interlinkages of production activities, self provisioning, recycling, and collective sharing are crucial for survival and growth in such an environment.

Diversity, or internal heterogeneity, resulting from spatial, temporal, physical, and biological differences over short distances, is an important feature of mountain areas (Troll 1988; Jochim 1981). This is a basis for both current and potential activities with significant interlinkages. If properly harnessed this offers potentials for higher productivity, without damaging the production potential of the resource base. Under traditional systems, whether one looks at the people's food chain, or income flows, or occupational patterns, diversification was the linchpin of resource management and production activities.

Niche represents the special situations in mountain areas where the resource base and environmental conditions of the mountains create potential for products and activities that have a comparative advantage over the plains (Brush 1988). Irrigation and hydropower potential, timber, tourism, minerals, and medicinal plants, are some examples of mountain niche. Most of its implications are quite similar to diversity, as it is partly a manifestation of the diversity of mountain resources. Mountain niche offer a number of opportunities for resource and product-centred activities which could enhance both productivity and human welfare on a sustained basis. "Harnessing with protection" has to be the key focus of interventions addressed to niche. Many of the multiple niche in the mountains are linked to land-based activities.

It should be noted that, within the mountain areas or single valleys, the above specificities vary significantly (e.g., all areas are neither uniformally fragile or equally inaccessible). Furthermore, most of the above characteristics, due to their common biophysical foundations, are interrelated. Handling of one may influence the others.

Mountain communities, through generations of experience, have understood these differences and have evolved methods of adapting to the limitations and potentialities of mountain conditions (Guillet 1983). Various features of traditional farming systems and resource management reflect them. Besides technological measures, the adaptations include institutional arrangements, such as the provision of common property resources and the employment of social sanctions, to regulate the use of fragile resources.

Mountain Specificities and Poverty - Implications

The implications of mountain specificities in terms of poverty can be considered at three interrelated levels of activities.

(i) Conditions reflecting the **potential** or usage capacities of the natural resource base (e.g., physical production possibilities, range and quality of production options, etc).

(ii) Circumstances of factors that condition the **harnessing** or management of production potential (e.g., technologies, human skills, infrastructure and other support systems, capital investment, etc).

(iii) The circumstances that determine the nature, scope, and **opportunities for exchange** activities that are an integral part of gainful harnessing of resource potential in an open and interlinked economic system (e.g., infrastructure, physical and market linkages, terms of exchange, etc).

Poverty alleviation also presumes **access to the gains** resulting from satisfaction of the above preconditions. A juxtaposition of preconditions of gainful economic activities (reducing poverty) and operational implications of mountain conditions (specificities) can reveal the complex of factors and processes underlying the poverty in mountain areas.

Inaccessibility, fragility, and marginality, in their respective ways, tend to obstruct the fulfillment of most of the preconditions for poverty alleviation in the field of primary production, harnessing of resource - niche, and trade and exchange. At the same time diversity and niche offer some scope for fulfilling the aforesaid preconditions for poverty alleviating activities.

Stated differently, the biophysical conditions of mountain habitats create various objective circumstances that not only impose structural constraints on production possibilities, but also shape the pattern of human responses, some of which may generate and accentuate poverty conditions. To elaborate on this we may reflect on both the traditional coping strategies of the people and present day development interventions in mountain areas. While doing so, rather than focussing on individual measures, we comment on their thrusts and approaches.

Traditional Coping Strategies

The traditional measures for handling the biophysical and related constraints and harnessing the opportunities in the mountains, though neither highly productive nor very effective in today's context, were able to support a sustainable living standard for the people under the situation of low population pressure on mountain resources. The potentially poverty-promoting conditions, such as availability of limited and low productivity, low payoff options, were met by focus on subsistence-oriented but stable agriculture and option maximisation through diversified, interlinked land-based activities (crop, livestock, forestry, etc), a great extent of resource/product recycling, and collective

sharing. The constraints imposed by the low carrying capacity of resources (reflected through the unsuitability of land-intensive practices and the low physical and economic input absorption capacities of land) were managed through resource upgrading (e.g., terracing), dependence on low cost, locally-available and locally-regenerated resources, and complementary use of land-intensive and land-extensive practices. Detailed evidence on these aspects has been collected by different scholars (Jochim 1981, Hewitt 1988, Guillet 1983, Jodha 1992, Allan et al. 1988).

From the point of view of 'poverty' in the context of a subsistence economy, mountain communities in the past seem to have sustained their survival (and growth in many cases) despite all the above-mentioned constraints. Besides the supply-oriented measures (e.g., diversified, resource-regenerative practices, recycling, etc), the institutional means for managing pressure on the resources (e.g., regulation on the intensity of resource use collective sharing, etc) were important factors behind the sustainable survival of the people (Sharma and Partap, 1993).

However, most of the above mechanisms facilitating sustainable survival (or absence of stark poverty) in the past involved a high degree of diversification; land-extensive production practices; and greater social discipline for resource-use regulation, collective risk sharing, etc. These practices are less feasible in the context of today's changed demographic and institutional environment (Jodha 1991). Moreover, through their side effects, both market and State interventions, in their respective ways, have not only added to the demand pressure on mountain resources but have also marginalised folk technologies and the role of community sanctions regarding resource use. The net result is the unsustainability of past survival systems and accentuation of poverty conditions in mountain areas (Jodha 1991).

Key Features of Development Interventions

Eradication of poverty in mountain areas has also become an integral part of development activities. A number of factors influenced the approach, design, and consequences of public interventions in mountain areas (Jodha 1992). These are discussed below.

Extension of Generalised Approaches

As a product of decision-makers' perceptions, training, background, and biases, most of the development interventions of anti-poverty measures in mountain areas are largely unmodified extensions of programmes evolved for non-mountain areas. Whether one looks at the 'food first' focus and discouragement to 'sideline activities' (e.g., diversification) in the pre-1978 policies of China, or the land reforms' programme of the 1960s and integrated rural development programmes since the 1980s in India, or high-yielding variety (HYV)-based agricultural production programmes in any of the HKH countries, the common feature is the imposition of externally-evolved approaches on mountain areas. The inappropriateness and ineffectiveness of the latter partly explain the persistence of poverty in mountain areas (Banskota and Jodha 1992a, Sanwal 1989).

Missing Mountain Perspective

Closely related to the above, another feature of development interventions is the disregard of mountain specificities. This applies to practically all activities ranging from choice of norms and yardsticks for investment allocation, performance evaluation, choice of technologies, administrative arrangement, and design of support services (Jodha 1990, Banskota and Jodha 1992a, 1992b). While fragility and marginality of mountain resources call for extensive types of land use, the production programmes promote intensification even on fragile slopes with the help of subsidies and extension advice. Similarly, while diversity calls for focus on interlinked land-based activities with multiple goals, the programmes encourage narrow specialisation using high, energy-intensive external inputs. Sectoral development projects segregate activities (e.g., crop, livestock, horticulture, forestry) which are organically interlinked in the mountains. The same may apply to infrastructural development when it fails to balance the vulnerability of fragile slopes with the design and density of roads. While inaccessibility and diversity call for decentralised and participatory approaches, most of the support services (credit, extension, etc) are centralised and rigidly structured (Jodha 1990, 1991, Banskota and Jodha 1992a).

Implicit Negative Orientation

In keeping with the concerns and approaches of the State towards mountain areas (e.g., relating to the backwardness and poverty of mountain areas, their integration with the mainstream systems, harnessing of mountain niche, etc), development interventions acquire a specific focus and orientation that have serious negative side effects for the mountain areas and their people. These are discussed below.

(a) Intensification of mountain resource use is the hallmark of all programmes directed to raise productivity, and especially programmes for mountain agriculture. However, their focus is on short-term considerations, guided by pressure to produce more, even from marginal and fragile resources. Thus, the intensification approach becomes indiscriminate. This disregards the value of the diversification and complementarity of intensive and extensive types of land uses; productivity of the total system (covering biomass as well); and importance of resource-regenerative processes. The final consequence of indiscriminate intensification means resource degradation, giving rise to the vicious degradation - poverty circle (Jodha 1991, 1992).

(b) Integration of mountain areas with mainstream plains' or urban economies through physical infrastructure, market links, and legal and administrative processes is a useful approach to reducing inaccessibility and its consequences. But the uncontrolled side effects of integration have several negative implications. This adds to the pressure of external demands on mountain resources and leads to their overextraction. Due to the marginality characteristics of mountain areas and people, the situation becomes dominated by mainstream concerns. The age-old resource management systems, regenerative folk agronomy, recycling and sharing systems, community control, and regulation of resource use become marginalised and disappear in due course (Jodha 1991). The poverty implications of such

changes hardly need elaboration. The creation of a dual sector economy, represented by commercialised accessible areas and subsistence-oriented distant areas, is another side effect of unbalanced integration.

(c) Extraction The products and activities with high comparative advantages in mountain areas, such as irrigation, hydropower, timber, tourism, and minerals, are obvious examples; where, guided by the needs of mainstream economies (and mountains), and governed by market signals and the State's revenue requirements, the resources and surpluses of mountain areas are syphoned off on unequal terms of exchange and compensation for local communities. As a result of the specific nature of technological and administrative as well as fiscal measures involved, there are very little local multiplier effects from such projects.

(d) Substitution (or imposition) implies discard of traditional measures, both technological and institutional, which were evolved and inherited by mountain communities for their sustainable survival. Besides the several examples already mentioned in different contexts, we may further add that development interventions have tried to substitute people's systems by government measures; natural processes of resource regeneration by bio-chemical subsidies; diversification by narrow specialisation; folk agronomic knowledge by externally evolved R & D-based technologies; and self-help and collective sharing by external relief (Jodha 1991).

For growth in productivity and removal of poverty in mountain areas it is necessary to complement traditional and modern knowledge. This aspect is not a strong point of development interventions.

Emerging Paradoxes

As a consequence of the above-mentioned features, most development interventions are generating rather paradoxical situations. The biggest of the visible paradoxes is that the measures directed to relaxing poverty-generating circumstances are also contributing to the processes that tend to accentuate poverty in mountain areas.

Without belittling the success of past development interventions in a number of areas, it should be added that, owing to their short-term focus and emphasis on symptoms rather than on basic processes (associated with mountain specificities and their interlinkages), these interventions in the bulk of mountain areas are leading to the emergence of unsustainability and prospects of increased poverty. While these interventions appear to be appropriate responses to poverty-generating constraints (e.g., increased resource-use intensity to raise productivity or harness mountain niche for high income and investable surplus, etc), they fail to match simultaneously the imperatives of resource characteristics (i.e., mountain specificities and their interlinks). Thus, once again, it is a case of the missing mountain perspective from development interventions leading to the paradox of anti-poverty measures helping accentuate poverty conditions. This explains the emerging dominant scenario in mountain areas where, despite increased development efforts, the poverty situation is worsening, especially in terms of health and productivity of the

resource base and per capita availability of products (Jodha 1992). ICIMOD has put together nearly two dozen indicators of such measureable or verifiable negative changes which are described as indicators of unsustainability (Jodha 1992, Shrestha 1992).

The Way Out

This calls for a fresh look at the development strategies for mountain areas. The linchpin of the new strategies has to be mountain development with a mountain perspective (Jodha 1991, 1992).

A few important considerations for such a development strategy are as follows.

Integrated Approach

A full understanding of mountain specificities and their imperatives is the first important step. Since most of the mountain specificities have common biophysical foundations, handling of one also affects the other. We already mentioned the example of roads for reducing inaccessibility, simulta-neously adversely affecting the fragile slopes, pace and pattern of extraction, and finally depletion of mountain niche; as well as the narrow specialisation in agriculture adversely affecting the diversity and sustainability of resource use. In fact the interrelationships of mountain specificities serve as a compelling basis for an integrated approach to mountain development (Jodha 1990, 1992).

Rationale of Folk Knowledge

Despite the better technological and fiscal resources of the State, development decision-makers cannot replace the mountain people's understanding of mountain conditions and their imperatives. At the same time, due to low productivity and other changed contexts, traditional production systems are neither an answer to the current problems of poverty nor can they be rehabilitated in their old form. However, their rationale is amply relevant today. Hence, the need for understanding them and integrating them into development interventions to avoid or minimise the "paradoxes" mentioned earlier (Jodha and Partap 1992).

A Two-pronged Approach

An important aspect of the diversity of mountain areas relates to the degree of accessibility. Depending on the other conditions, such as fragility, marginality, resource diversity, and niche, the accessible and remote or inaccessible areas need different focusses. Building on the already visible process of transformation in accessible areas, agro-business oriented measures may need greater emphasis in accessible areas. As ICIMOD studies in some areas of Himachal Pradesh (India), Ninang County (West Sichuan, China), Ilam district (Nepal), to cite a few cases, have demonstrated, it is possible to raise income and welfare options for the people through commercialisation and diversification without undue resource degradation. For inaccessible areas, a focus on biomass productivity and stability, with orientation towards harnessing specific niche for commercial purposes, seems to be the better strategy. However, the external, commercial

linkage will help mountain people only if they are equitable and unexploitative. The investment, R & D, and support service logistics will have to be designed in keeping with the above two-pronged approach.

De-marginalisation of Mountain People / Areas

One of the primary reasons for disregard of mountain specificities by mainstream decision-makers is the 'marginal status' of mountain areas, mountain production systems, mountain people, and their knowledge vis a vis their counterparts in plains/urban areas. Due to marginality, not only do they count the least in the decision process affecting the mountains, but they are also subject to exploitation through unfavourable terms of exchange when mountain areas/people are integrated into the mainstream situation. Lipton (1977) elaborates such issues in a wider context. This could be a long process with several political implications, yet demarginalisation of mountain people is an essential step in mountain development with a mountain perspective. In concrete terms it may involve the mountain people's command over mountain resources and consideration of their knowledge and concerns in designing development interventions, ensuring a fair share in gains from harnessing their niche with external assistance. This also implies empowerment of groups such as mountain women who are key managers of the environment and resources at village level.

The ongoing work at ICIMOD is focussed on designing a thinking process, project formulation, and field action incorporating the above (a to d) considerations.

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POVERTY AND ANTI-POVERTY ISSUES IN THE CONTEXT OF MOUNTAIN REGIONS

Vineeta Hoon

Introduction

Poverty eradication and sustainable development are recognised as important dimensions of development. The NGOs' Poverty Treaty[2] (1992) describes poverty as a state of deprivation of the essential elements necessary for a human being to live and develop with dignity, physically, mentally, and spiritually, while accounting for specific needs relating to gender, ability/disability, cultural values, age, and ethnicity. The treaty further states that poverty is the result of the present development model rooted in the exploitation of people and nature. Social inequalities result from unequal access to resources and people's exclusion from the political decision-making process. The centralisation of power to control natural resources causes, simultaneously, poverty and environmental degradation.

This point is highlighted in the UNDP's Human Development Report (1992). Income disparities have widened dramatically in recent years. In 1960, the richest 20 per cent of the world's population had incomes 30 times greater than the poorest 20 per cent. By 1990, the richest 20 per cent were getting 60 times more. This comparison is based on the distribution between rich and poor countries. If we add the maldistribution within countries, the richest 20 per cent of the world's people get at least 150 times more than the poorest 20 per cent (Figure 1).

Global poverty is one of the greatest threats to the sustainability of the physical environment and to the sustainability of human life. Most of the poor live in ecologically vulnerable areas - 80 per cent of the poor in Latin America, 60 per cent in Asia, and 50 per cent in Africa. They overuse their marginal lands for fuelwood, subsistence farming, and cash crop production, further endangering their physical environment and thereby their own future survival.

Special Characteristics of the Mountains

Mountains have very special characteristics that distinguish them from the plains in general. Understanding these characteristics helps us in the interpretation of mountain societies, or in the design of future mountain development programmes that are sensitive to the specific prospects, and limitations of mountain areas. The framework for mountain characteristics developed by researchers at ICIMOD is an important contribution towards understanding mountains.

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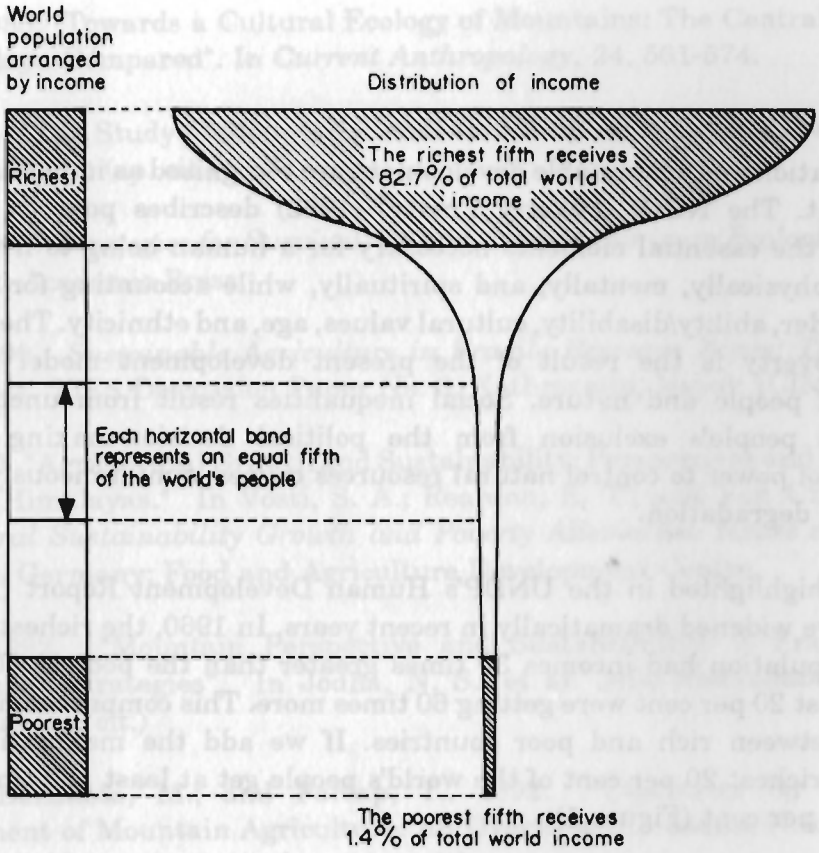
2 The NGOs' Forum was a part of the UN Conference on Environment and Development (UNCED) held at Rio de Janeiro in June, 1992.

Figure 1:



The cover design shows the global distribution of income. The richest 20% of the world's population receives 82.7% of the total world income while the poorest 20% receives only 1.4%. Global economic growth rarely filters down. The global income distribution by quintile is as follows.

World Population		*World income*
Richest	20%	82.7%
Second	20%	11.7%
Third	20%	2.3%
Fourth	20%	1.9%
Poorest	20%	1.4%

As one travels through high mountain regions like the Himalayas, two things become apparent by their repetition. The first is the immense variety of mountain landscape with its multiple altitudinal zones, each characterised by different micro-climatic and biotic zones. The second is the adaptation of the indigenous population to this landscape[3].

One of the primary characteristics of mountains is "Verticality" or the altitudinal zonation of climatic zones. Mountain terrain compresses the major climatic belts and vegetation zones of the world into single hillsides. These zones are, however, rarely neatly arranged in layers. A number of intervening edaphic factors, associated with rugged terrain, greatly modifies the vertical biotic zonation and creates several ecological niche. Mountains therefore are areas of great ecological complexity. Another feature of these zones is that almost none of the zones are capable of supporting all the needs of a population throughout the year, and less than 10 per cent of the land area is available for cultivation. Mountain resources are fragmented over space and time (Figure 2).

The mountain economy involves the sustainable utilisation of the vegetation zones at different altitudes, in particular the large expanses of alpine pastures found at altitudes between 3,800m to 4,500m. These pastures are buried under snow for six months a year and can only be utilised in the summer season. Since these pastures can provide nutritive fodder for sheep and goats during the summer season, mountain societies developed an agropastoral economy based on transhumance. Transhumance is the movement of people between established summer areas and winter villages. This combination of cultivation and herding, variously labelled agro-pastoralism, mixed mountain farming, or *Alpwirtschaft*, is found in almost all the high mountain areas of the world. A unique feature of the Himalayan border communities of India and Nepal is that they have developed a very intricate system of agriculture, pastoralism, and trade based on transhumance and nomadism. Figure 3 depicts a model of the *Bhotia* transhumant economy and Table 1 give the time-space structure of the Bhotia habitat. Figures 4 and 5 show how political decisions can drastically alter the resource flows within the economy. It is very important to note that biological diversity forms the very basis for the subsistence of mountain people and economic development in the region. The loss of biodiversity, with all it entails in terms of foregone economic opportunities, is the paramount environmental issue of today.

Poverty and Anti-poverty Issues in Mountain Areas

Poverty issues are critical in mountain areas. Critical, since mountains have very fragile ecosystems and are essentially marginal areas. Land capability is low and the arable land constraint is particularly severe. Due to the short growing season in high mountain areas, agricultural productivity is limited to a single crop a year. The basic difficulties related to the terrain make building essential infrastructure like roads and railways very expensive and even impossible at times. Thus limited transport, power, and other rural infrastructure constrain development.

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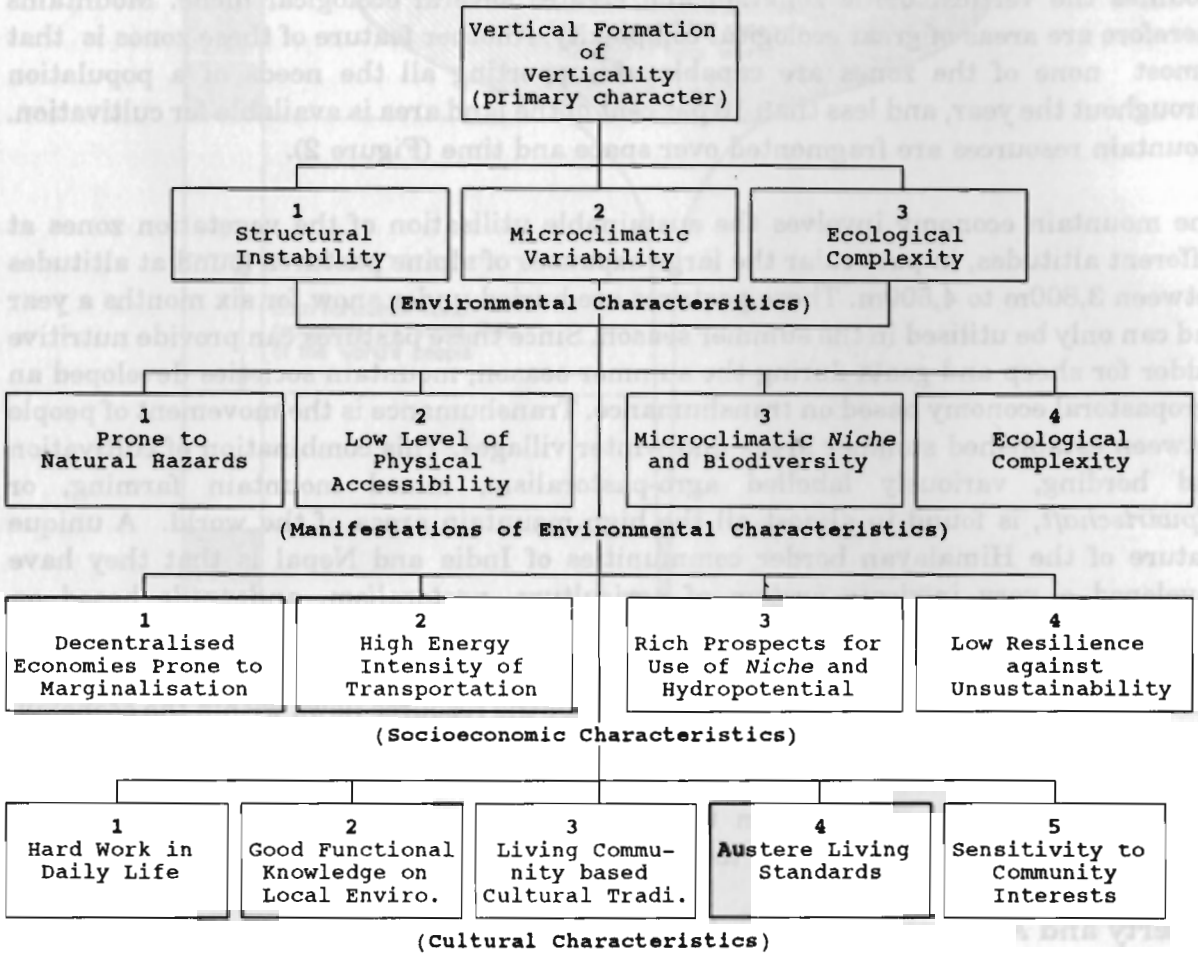
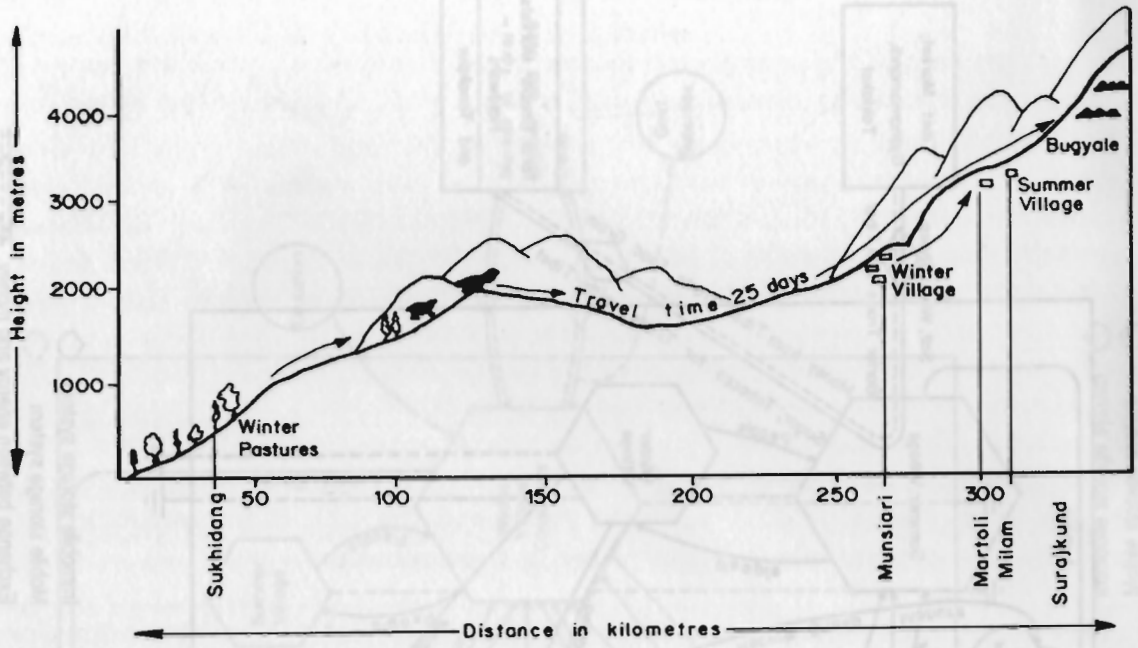
3 It is important to differentiate between high mountain habitats like the Himalayas, hills, residual mountains, and plateaux. Only in these high tropical mountains does one find a range of altitudinal zonation of climates from the tundra to the tropical. My focus remains in high mountain regions and their management with the help of indigenous knowledge. I would especially like to see sustainable development programmes for the minority communities who occupy these areas.

Figure 2: The Mountain Characteristics



Source: Bandyopadhyay, J., 1992

Figure 3: Fragmentation of Bhotiya Resources into Altitudinal Zones (Bhotiya Habitat)



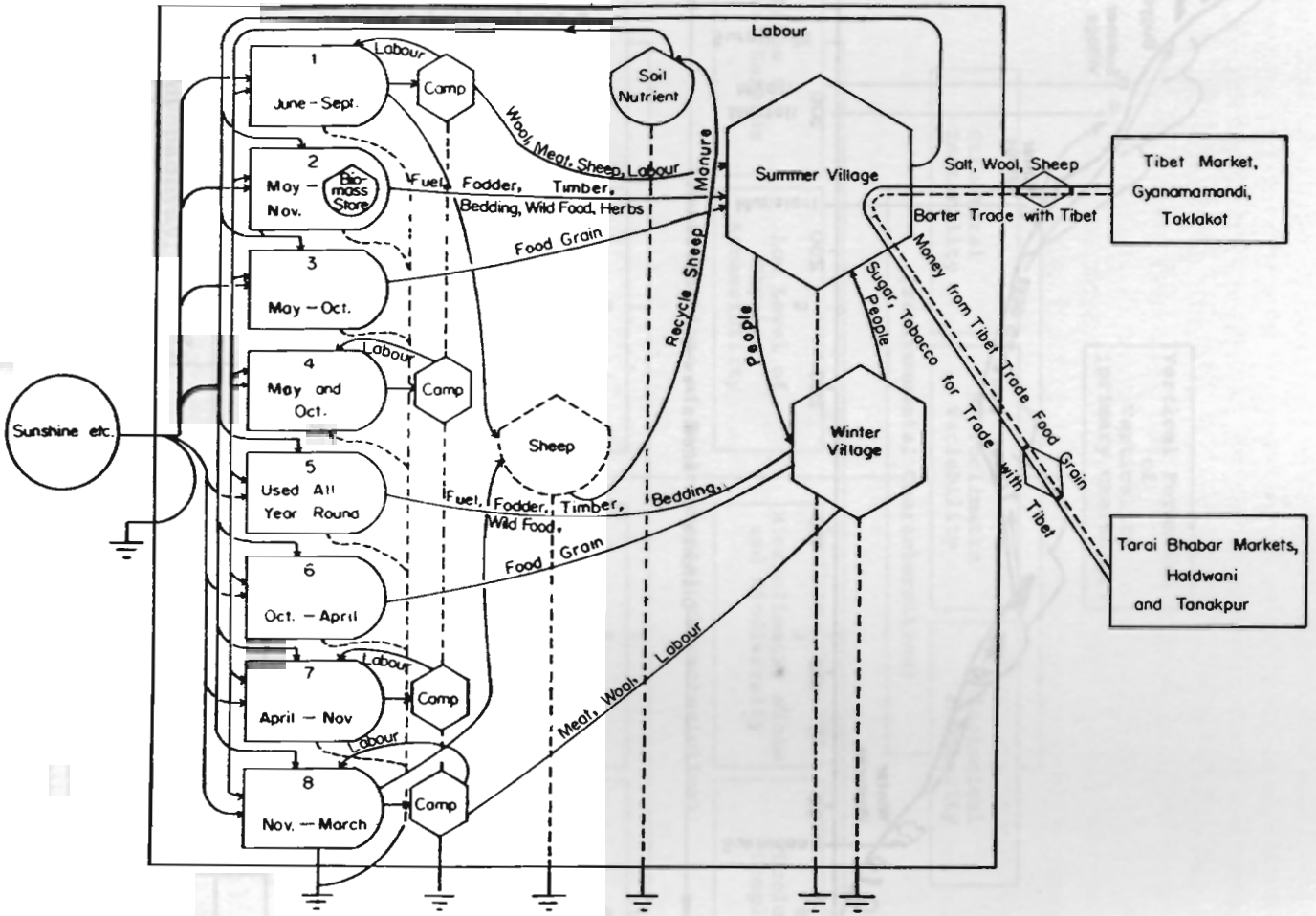
A profile along the migration routes of the shapherds and transhumant farmers based on personal observations by the author in summer 1986.

Table 1: Time Space Structure of the *Bhotia* Habitat

Resource	Location-Space		Season-Time	
Agricultural land	Summer village Winter village	(3.300m) (1.000m - 2.300m)	Summer Winter	(Ma-Oct) (Oct-Apr)
Pasture	Alpine pastures *Terai* pastures Around winter villages & along migratory routes	(4.000m) (1.000m)	Summer Winter Spring Autumn	(Jun-Sep) (Dec-Mar) (Apr-May) (Oct-Nov)
Fuelwood	Summer village Winter village	(3.000m) (1.000m - 2.300m)	Summer Throughout the year	(May-Oct)
Medicinal plants	Summer village Forests	(3.300m - 3.600m)	Summer	(May-Oct)

Source: Author's field survey in 1985-1986.

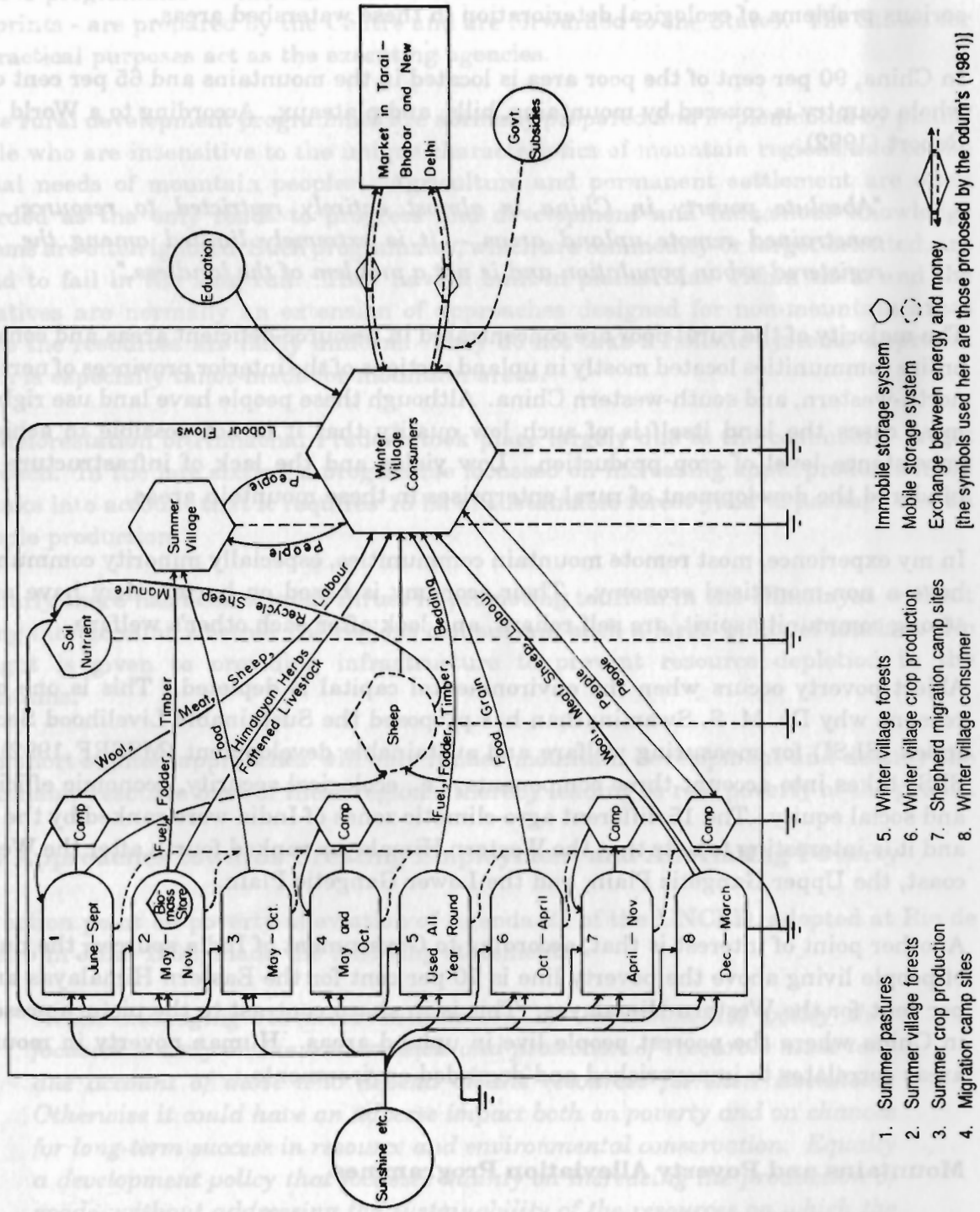
Figure 4: Resource Flows after 1959



1. Summer pastures
2. Summer village forests
3. Summer crop production
4. Migration camp sites
5. Winter village forests
6. Winter village crop production
7. Shepherd migration camp sites
8. Winter village consumer

Immobile storage system
Mobile storage system
Exchange between energy and money
[the symbols used here are those proposed by the odum's (1981)]

Figure 5: Resource Flows before the Indo-China Border Closed



Nearly half of the world's population is affected in various ways by mountain ecology and the degradation of watershed areas. About 10 per cent of the world's population lives in the high altitude areas. Minority peoples constitute a large share of the population living in the mountains. They lead very simple lives based on an agropastoral economy and take the best advantage of the seasonal resources offered by mountain ecosystems. Another 40 per cent occupy the adjacent medium and lower watershed areas. There are serious problems of ecological deterioration in these watershed areas.

In China, 90 per cent of the poor area is located in the mountains and 65 per cent of the whole country is covered by mountains, hills, and plateaux. According to a World Bank Report (1992),

> *"Absolute poverty in China is almost entirely restricted to resource constrained remote upland areas -- it is extremely limited among the registered urban population and is not a problem of the landless."*

The majority of the rural poor are concentrated in resource-deficient areas and consist of entire communities located mostly in upland sections of the interior provinces of northern, north-western, and south-western China. Although these people have land use rights, in most cases the land itself is of such low quality that it is not possible to achieve a subsistence level of crop production. Low yields and the lack of infrastructure have hindered the development of rural enterprises in these mountain areas.

In my experience, most remote mountain communities, especially minority communities, have a non-monetised economy. Their economy is based on barter, they have a very strong community spirit, are self reliant, and look after each other's welfare.

Abject poverty occurs when the environmental capital is depleted. This is one of the reasons why Dr. M. S. Swaminathan has proposed the Sustainable Livelihood Security Index (SLSI) for measuring welfare and sustainable development (MSSRF 1992). The SLSI takes into account three components, i.e., ecological security, economic efficiency, and social equity. The 15 different agro-climatic zones of India were ranked by the SLSI and it is interesting to note that the Western Himalayas ranked fourth after the Western coast, the Upper Gangetic Plain, and the Lower Gangetic Plain.

Another point of interest is that, according to Government of India sources, the number of people living above the poverty line is 70 per cent for the Eastern Himalayas and 80 per cent for the Western Himalayas. This is in sharp contrast to the picture presented in China where the poorest people live in upland areas. Human poverty in mountain areas correlates to impoverished and degraded environments.

Mountains and Poverty Alleviation Programmes

India and China are among the few countries where poverty alleviation is recognised as a major objective of the State Policy. The major poverty alleviation programmes (PAP) in India are Integrated Rural Development Programmes (IRDPs), Integrated Tribal Development Programmes (ITDPs), National Rural Employment Programmes (NREPs),

and Rural Landless Employment Guarantee Schemes (RLEGS). Very similar schemes are followed in China, in addition they have set up a Leading Group for the Economic Development of Poor Areas (LGEDPA).

All these programmes have acquired a uniformity in design and content. The proformas of these programmes - which in most of the circumstances have acquired the status of blueprints - are prepared by the Centre and are forwarded to the States. The States for all practical purposes act as the executing agencies.

These rural development programmes are normally prepared and implemented by plains' people who are insensitive to the unique characteristics of mountain regions and to the special needs of mountain peoples. Agriculture and permanent settlement are often regarded as the only roads to progress and development and indigenous knowledge systems are often ignored. Such programmes, which are commodity-or target-oriented, are bound to fail in the long run. They have a built-in plains' bias within them and the initiatives are normally an extension of approaches designed for non-mountain areas where the resources are fairly uniform. They do not take a holistic systems' approach which is especially tailor-made for mountain areas.

The deforestation of Himachal Pradesh took place largely due to the commodity-target approach. In the late sixties, a programme focussed on increasing apple production did not take into account that it requires 15 ha of sustainable forest yield to package one ha of apple production.

Similarly there has been a great thrust in promoting tourism in the Himalayas without taking into account whether the regions can sustain such a large influx of tourists. No thought is given to providing infrastructure to prevent resource depletion in the mountains.

Such short-sighted approaches will only hinder mountain development and destroy the sustainable resource base of these regions, thereby leading to real poverty of the people.

New Approaches towards Creating Employment and Alleviating Poverty

The action point on poverty alleviation of Agenda 21 of the UNCED, adopted at Rio de Janeiro in June 1992, made the following statement.

> "*While managing resources sustainably, an environmental policy that focusses mainly on the conservation and protection of resources must take due account of those who depend on the resources for their livelihood. Otherwise it could have an adverse impact both on poverty and on chances for long-term success in resource and environmental conservation. Equally a development policy that focusses mainly on increasing the production of goods, without addressing the sustainability of the resources on which the production is based, will sooner or later run into declining productivity, which could also have an adverse impact on poverty. A specific anti-poverty strategy is therefore one of the basic conditions for ensuring sustainable development.*"

A systems' approach is needed for the sustainable development of mountain areas. It is extremely important to understand who is utilising what areas and how. For example, shepherd communities who are dependent on common pastures utilise all the altitudinal zones to find fodder for their sheep. In the winter time they have to interact with sedentary agricultural communities and share land and biomass resources with them.

The traditional approach towards district planning will not do in mountain areas. There is little future for it in terms of earlier concepts of economic development, with little or no recognition of environmental factors. Hill development can no longer be regarded as a mere extension of development methods in the plains.

Promoting integrated watershed development programmes, through the effective participation of local people, is a key to preventing further ecological imbalance. An integrated approach is needed for conserving, upgrading, and using the natural resource base of land, water, plant, animal, and human resources. In addition, promoting alternative livelihood opportunities, particularly through development of employment schemes that increase the productive base, will have a significant role in improving the standard of living among the large rural population living in mountain ecosystems.

As a consequence of the natural limitations of agricultural production, hill development should include significant alternative sources of employment and income generation, e.g., horticulture, medicinal plants, forestry, animal husbandry and fodder production, fisheries, and tourism. Off-farm employment can be created through the promotion of small and medium agro-based enterprises.

The M.S. Swaminathan Research Foundation is currently engaged in developing two projects which could be adapted to suit the development of poor mountain areas. The aim of the agri-business for small farmers' project is to take the benefit of modern-agribusiness to resource poor rural men and women. The technologies introduced should be economically profitable and ecologically sustainable. The aim is to impart a pro-poor, pro-women, pro-nature bias in enterprises designed to create new jobs in the farm and non-farm sectors in rural India. These programmes focus on empowering resource poor farmers with the help of legal organisational structures such as societies, cooperatives, or companies.

The project design teams are tailor-making projects to suit the requirements of almost every agri-ecological zone in the country. Specific land use is promoted based on the classification of land into three major categories: 1) conservation areas, 2) restoration areas, and 3) sustainable intensification areas. This classification is made by data interpretation using remote-sensing satellite imagery and GIS technology.

The following steps need to be taken to develop a holistic resource management plan for mountain areas.

1. Organise a body at national level to provide policy guidance and managerial support.

2. Set up a multi-disciplinary project design team, including representatives of minority communities and farm families, to identify the mix of enterprises that is suitable to a specific area.

3. With the help of local people identify enterprises that can provide value addition to the work hours spent by women and men belonging to landless labour families.

4. Create linkages with credit and marketing plans. It is important to involve financial institutions that give rural credit in the preparation of these plans.

5. Improve infrastructure with power, roads, and ropeways. Here the focus should be on alternative sources of energy such as solar, wind, and micro-level turbines. This will also help reduce the dependency on forests.

6. The programmes should have a built-in gender bias and should be pro-women. It is women who do 85 per cent of farm-related work, although women's work is invisible in government statistics despite the substantial economic contribution made by them. Extension workers should be women, or at least sensitive to women's needs.

7. Since mountains are still the storehouses of traditional food crops, biodiversity should be promoted through *in situ* conservation. A low-cost gene bank could be established in high altitude regions. Because of the extreme cold and high altitude conditions, these genetic materials can be preserved for several 100 years.

8. Develop an effective information strategy, since the new techniques introduced will be knowledge-and management-intensive. Information villages should be set up in the project areas. Information and media support will be vital for spreading ecologically-sound technologies where timely information and action substitutes systems based on the integration of meteorological management and marketing data of relevance to that area.

9. Discuss the preferred option with reference to institutional structures, i.e., cooperative society, company, informal association, with the participants. Develop a legal and management structure suited to the local socioeconomic and socio-political conditions.

Several examples from Nepal and India can be given of what could happen if local people lose their control over resources. In these countries, where the local people had, as a matter of long tradition, used and managed adjacent forests, the Government, in its efforts to arrest deforestation, took all the control into its hands by prohibiting the people from going into the forests. Neglect of the needs and livelihoods of the inhabitants has proved expensive. The deprived people no longer take interest in caring for what they perceive as government-owned resources. They defy all the punitive measures imposed and plunder the forests. The worst case that comes to mind is that of the Bodoland crisis in India where the Bodos have destroyed the Manas Sanctuary which has a protected area status.

The Biovillage Concept

Creation of opportunities for skilled jobs, particularly for women and educated youth, is a challenging and urgent task in the villages. The Centre for Research for Sustainable Agriculture and Rural Development (CRSARD) has hence undertaken research on promoting skilled employment through the integration of traditional and frontier technologies. The first kind of technology chosen for this purpose is biotechnology. The term "biovillage" is being used to denote the integration of recent advances in biological technology with the best in traditional techniques in such a manner that the livelihood security of the rural people can be upgraded ecologically and economically (Figure 6). The principal mechanism for the establishment of a biovillage is the formation of a biovillage society and a biocentre at the village level.

The aims of this project are

1. to promote the use of natural resources in an efficient and sustainable manner,

2. to achieve a continuous and steady growth of agricultural production, and

3. to protect and improve the livelihood security of the rural poor.

Unless the ecological security of the farm and the economic well-being of the farm family are linked in a symbiotic manner, sustained advances in agricultural productivity cannot be achieved. Thus the basic paradigm of the biovillage project involves considerations of

- ecological sustainability,
- participatory research and development,
- economic efficiency coupled with equity,
- women's employment and income generation, and
- attracting and retaining educated youth in rural professions.

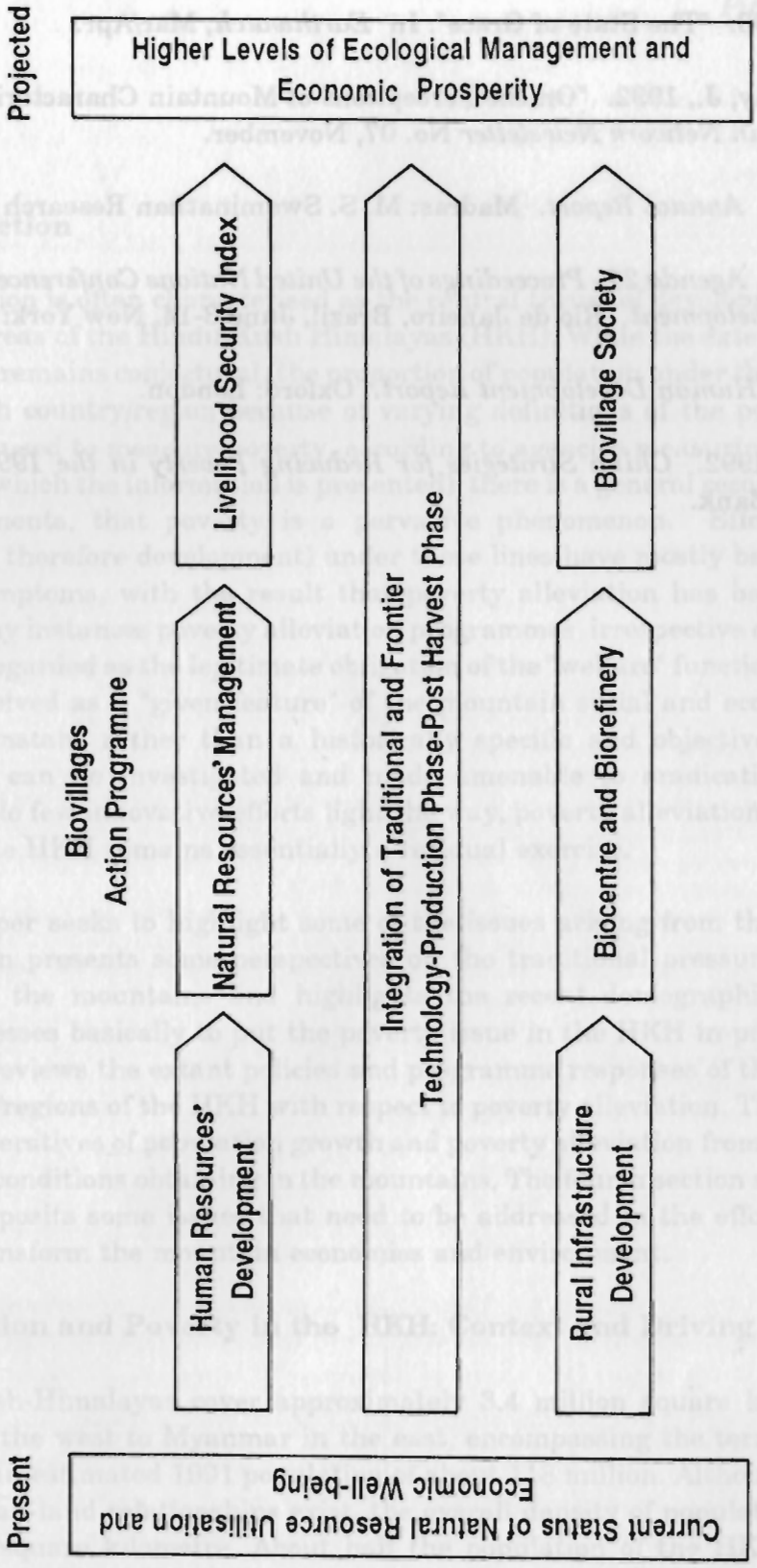
Such a project should help to foster a new social contract between the rural poor and the professionals working on the forward edge of Science and Technology.

The impact of the project will be measured by:

- the improvement in environmental quality,
- the number of jobs created in non-traditional sectors, and
- the reduction in migration of educated youth from urban areas.

A project for the establishment of biovillages in India and China was initiated in February 1991. This project is a joint venture being carried out by the Centre for Research for Sustainable Agriculture and Rural Development (CRSARD), Madras, and the Chinese Academy of Sciences (CAS). It is currently being implemented in the Taihang mountain area of Hebei Province in China and in three villages in Pondicherry, India, and could provide an alternative model for the sustainable development of mountain areas in the future.

Figure 6: Conceptual Diagram of the Biovillage Project



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POPULATION, POVERTY, AND DEVELOPMENT ISSUES IN THE HINDU KUSH-HIMALAYAS

Pitamber Sharma
Tej Partap

1. Introduction

Poverty alleviation is often characterised as the central thrust of development in most of the mountain areas of the Hindu-Kush Himalayas (HKH). While the extent of poverty in mountain areas remains conjectural (the proportion of population under the "poverty line" differing in each country/region because of varying definitions of the poverty line, the varied methods used to measure poverty, according to agencies measuring them, and by the purpose for which the information is presented), there is a general recognition, at least in policy documents, that poverty is a pervasive phenomenon. Efforts at poverty alleviation (and therefore development) under these lines have mostly been attempts at treating the symptoms, with the result that poverty alleviation has become a virtual paradox. In many instances poverty alleviation programmes, irrespective of their content, are invariably regarded as the legitimate obligation of the "welfare" functions of the State. Poverty is perceived as a "given feature" of the mountain social and economic order, a geographical constant rather than a historically specific and objectively determined problem which can be investigated and made amenable to eradication, control, or alleviation. While few innovative efforts light the way, poverty alleviation in much of the mountains of the HKH remains essentially a residual exercise.

The present paper seeks to highlight some of the issues arising from this context. The following section presents some perspectives on the traditional pressure management mechanisms in the mountains and highlights the recent demographic changes and associated processes basically to put the poverty issue in the HKH in perspective. The second section reviews the extant policies and programme responses of the governments of the countries/regions of the HKH with respect to poverty alleviation. The third section looks at the imperatives of population growth and poverty alleviation from the standpoint of the objective conditions obtaining in the mountains. The fourth section summarises the discussion and posits some issues that need to be addressed in the efforts to alleviate poverty and transform the mountain economies and environment.

2. Population and Poverty in the HKH: Context and Driving Forces

The Hindu Kush-Himalayas cover approximately 3.4 million square kilometres from Afghanistan in the west to Myanmar in the east, encompassing the territories of eight countries with an estimated 1991 population of about 118 million. Although tremendous variations in man-land relationships exist, the overall density of population is about 35 persons to the square kilometre. About half the population of the HKH inhabits the southern part of the Great Himalayan crestline. Area-wise China covers about 48 per cent of the HKH, but the largest population share (30 per cent) is that of the Indian Himalayas (Table 1).

Table 1: Area and Population of the Hindu-Kush Himalayas

Country	Inclusions	Area (sq. Km.)	Approximate Population 1991 (in million)	Density of Population (per Km²)
Afghanistan[1]	25 of the 30 provinces	390,475	13.8	35
Bangladesh[2]	Chittagong Hill Tracts	13,189	1.2	57
Bhutan[3]	Entire Territory	46,500	1.4	30
China[4]	All of Xizang and parts of Yunnan and Sichuan Provinces	1,647,725	19.6	12
India[5]	All of 8 and part of 3 northern States	482,920	35.0	73
Myanmar[6]	Kachin, Chin, and Shan States	280,862	5.8	21
Nepal[7]	Entire Territory	147,181	18.5	126
Pakistan[8]	N.W.F.P., F.A.T.A., and 12 of the 16 districts of Baluchistan	404,195	22.7	56
TOTAL		3,413,047	118.0	35

1. Excludes Kandahar, Helmand, Nimroz, Farah, and Herat Provinces.
   Source : *UNIDATA (1991) Afghanistan Population Estimates*, UNIDATA, Kabul
2. Source : *Chittagong Hill Tracts District Statistics, 1983*
   Population projected from past trends.
3. Source : Bhadra and Alirol (1986) Bhutan - Issues in Integrated Mountain Development, ICIMOD Internal Document.
   Population projected from trends indicated in World Bank (1984) *Bhutan, Development in a Himalayan Kingdom.*
4. Includes all of Xizang Autonomous Region and the following prefectures/districts of Yunnan and Sichuan: Yunnan - Baoshan, Lijian, Nujiang, Diqing, Dali and Chuxiong Sichuan - Yaan, Aba, Ganzi, Liangshan and Dukou.
   Source : *Statistics of Population at County Level, 1987* (PRC)
5. Includes all of Jammu and Kashmir, Himachal, Sikkim, Manipur, Meghalaya, Nagaland, Arunachal, and Mizoram States and Uttar Kashi, Chamoli, Tehri Garhwal, Dehradun, Pauri Garhwal, Pithorragarh, Almora, and Nainital districts of Uttar Pradesh; Jalpaiguri and Darjeeling districts of West Bengal; and Karbi Anglong, North Cachar Hills, Lakhimpur, Cachar, and Sonitpur (Darrang) districts of Assam.
   Source: *Census of India*, 1991, and *Social and Economic Atlas of India, Oxford, 1987* (Muthiah 1987)
6. Source: *Facts About Burma* (1983)
   Population projected from past trends.
7. Source: Nepal 1991 Census, Preliminary Results.
8. Excludes Kachhi, Nasirabad, Las Bela, and Gwadar districts of Baluchistan
   Source: *Census Report of Pakistan 1981*
   Population projected from past trends.

Compiled by: Pitamber Sharma, Population and Employment Division, ICIMOD.

Note: Because of overlapping claims on some areas the area figures given above should only be taken as indicative and do not imply any judgement on the legal status of any territory or any endorsement or acceptance of such boundaries.

These mountain areas have always posed enormous challenges for human habitation. The vertical dimension manifest in the constraints of altitude and relief imposes limits to land use and human habitation (Groetzbach 1988). The choice of productive activities is often determined by variations in slope, aspect, soil depth, differences in thermal regime, water availability, and geological and geomorphic conditions (Whiteman 1988). The barriers of altitude and relief hinder transportation and overcoming these barriers entails enormous costs. While not all the elements of the vertical dimension constitute a natural

disadvantage to mountain populations, the mountain farmer has traditionally been at a disadvantage compared to his\her counterpart in the plains. Isolation also made mountains peripheral to centres of innovation. Eking out a living under such circumstances has historically been a continuous struggle.

Traditional Forms of Adaptation to Population Growth and Poverty

A number of mechanisms was, however, operative that enhanced the capacity of the mountain areas to sustain both population growth and the incidence of poverty. Historically, population growth rates remained lower due to high fertility and mortality regimes. Although consistent historical data on population changes in the HKH are not available, information that goes back to the latter part of the 19th century, particularly for the Indian Himalayas, suggests that growth rates for the U.P. hills, for example, remained at about 1.0 to 1.2 per cent per annum (Singh 1990a). The population of the Nepalese hills is estimated to have increased only slightly in the 19th century (Poffenberger 1980). A similar situation seems to have prevailed in other mountain areas of the HKH.

In the Buddhist highland areas (Tibet, northern Nepal, north-western trans-Himalayan areas of India, and, till recently, Bhutan) there were also cultural sanctions that favoured population control (e.g., the eldest son becoming a Buddhist monk in Bhutanese society, as also among the Sherpas and other Tibetan communities). The polyandry system in Himachal Pradesh, India, and in the northern borderlands of Nepal and Tibet, for example, was a consequence of the economic imperatives of keeping intact the productive assets of the family, and it also played a role in limiting the size of the family (Parmar 1975, Schuler 1987).

Increases in population were accompanied by the increasing use of labour-intensive technologies (Boserup 1965), perhaps more so in mountain areas. The ethno-engineering ingenuity reflected in the terracing of hill slopes exemplifies both the adaptive resiliency of the hill farmer as well as a rare understanding of the biophysical processes (Rhoades 1985). A variety of adaptations, ranging from variations in farming systems, cropping pattern and intensity, crop selection, and crop mixes helped in augmenting agricultural production. New crops (maize and potatoes in the Himalayas, for example) created a new basis for sustaining population growth (Schroeder 1985). Population growth at higher altitudes was sustained through a mix of agriculture, pastoralism, and trade.

Migration in search of living space has been characteristic of mountain populations for a long time. Increase in population led to changes in the form of this migration. For a long time, however, such migration was restricted to areas and regions within the mountain environment itself (Skeldon 1985). Migration was also prompted by political developments and the evolving relationship of the mountain economy to the larger State and the regional/global economy. This is exemplified by the migration history of the central Himalayas (particularly the Nepal Himalayas) (Gurung 1989). Non-agricultural opportunities in much of the HKH mountains were severely limited and only those areas that were centres of entrepot trade experienced some form of traditional urbanisation (Sharma 1989).

Processes of Change

The adaptive mechanisms described above began loosing their relevance in the population and poverty context of the HKH both due to internal and external sources of demographic pressure.

In the last half a century or so, most of the areas of the HKH have witnessed dramatic declines in mortality rates, whereas fertility rates still remain relatively stable at high levels. The relatively rapid reduction in mortality rates was made possible by the introduction of western medicine and eradication, for the most part, of dreaded contagious diseases, such as smallpox, which took their toll of thousands and often decimated whole villages. Development programmes that led to improvements in curative health care broke down traditional forms of family limitation. Malaria eradication in the valleys of the middle mountains, all across the north-eastern states of India, Nepal, and contiguous regions, helped to bring these lands under relatively intensive cultivation. Development in transportation in many mountain areas complemented the health revolution by setting the stage for the rapid incorporation of the mountain economies into the wider regional and global economy. The case of timber exploitation in the U.P. hills, in many parts of north-eastern India, the NWFP in Pakistan, and the mountains of West Sichuan in China elucidate this process.

Trends in Population Growth

Most areas/regions of the HKH have experienced a steady rise in population growth rates, particularly since the 1950s (Table 2). During the 1970s, for example, the mountain regions of India experienced growth rates of around 2.6 per cent per annum. Although some hill states, such as Himachal and Sikkim, evidenced slight declines in growth rates during the 1980s, the present growth rates are still higher relative to the 1930s and 1940s. In some north-eastern states (Arunachal Pradesh and Nagaland, for example) the growth rates appear to be much higher in the 1980s than in the 1970s. Nepal has experienced steady growth in population since the 1930s. The total population has grown from about 5.5 million in 1930 to 18.5 million in 1991. The growth rate, which was about 1.64 per cent in the 1950s, rose to 2.05 per cent in the 1960s, to 2.66 per cent in the 1970s. The recent census evidences a slight decline, but this needs to be evaluated in light of the possible undercounting of male migrants. Nepal, it may be noted, is the most densely populated among the countries of the HKH. Although authentic population figures for Bhutan are not available through periodic censuses, it is reported that the growth rate, which was about 1.6 per cent for the 1970s, went up to about two per cent in the 1980s. The Chittagong Hill Tracts of Bangladesh, which had a population growth rate of about two per cent in the 1960s, experienced a dramatic rise in population in the 1970s (5.64 %). Although much of this growth, contributed largely by migration from the plains, was probably not sustained in the 1980s, the magnitude of growth must still be significantly high. A similar situation seems to prevail in Pakistan where most of the northern areas and the NWFP have growth rates exceeding three per cent. Although the density of population in the mountain areas of China is comparatively lower, the growth rate in West Sichuan in the 1980s is estimated to be around 1.44 per cent, a rate much higher by Chinese standards. In Tibet, the estimated growth rate of about 1.7 per cent in the mid-1980s also evidences this pattern. It may be noted that mountain regions of China have a number of minority nationalities for whom population control policies are not as rigorously pursued as for other groups.

Table 2 : Population Growth Rates in Selected Areas/Regions of the HKH

Country/Region		Growth Rates	Remarks/Source
Afghanistan (for settled population; UNIDATA estimates for 1980[5])		1.95	UNIDATA estimates
Bangladesh			
Chittagong Hill Tracts	1951-61	2.97	Chittagong Hill Tracts District Statistics, 1983
	1961-74	2.16	
	1974-81	5.64	
India			
Arunachal Pradesh	1961-71	3.34	Source: M.K. Premi & R.P. Tyagi, 1982
	1971-81	3.06	
	1981-91	3.11	
Manipur	1941-51	3.13	
	1951-61	2.42	Population of India, Country Monograph # 10 ESCAP
	1961-71	2.78	
	1971-81	2.82	
	1981-91	2.54	Census of India Provisional Population Totals. Paper 2 of 1991
Nagaland	1941-51	1.17	
	1951-61	5.60	
	1961-71	3.41	
	1971-81	4.14	
	1981-91	4.60	
Meghalaya	1951-61	2.42	
	1961-71	2.78	
	1971-81	2.82	
	1981-91	2.80	
Sikkim	1941-51	1.26	
	1957-61	1.65	
	1961-71	2.61	
	1971-81	4.19	
	1981-91	2.51	
U.P. (8 districts)	1881-91	1.2	
	1961-71	2.40	
	1971-81	2.38	
Himachal	1941-51	0.53	
	1951-61	1.66	
	1961-71	2.09	
	1971-81	2.15	
	1981-91	1.79	
Jammu & Kashmir	1951-61	0.91	
	1961-71	2.63	
	1971-81	2.63	
	1981-91	2.57	
Nepal	1952/54-61	1.65	Nepal, CBS, 1987
	1961-71	2.07	
	1971-81	2.66	Nepal, CBS, 1991
	1981-91	2.08	
Bhutan	1965-80	1.6	World Bank, 1984
	1980 +	2.0	
Pakistan NWFP	1951-61	2.32	
	1961-72	3.52	Pakistan, NWFP Statistics, 1987
	1972-81	3.12	
China			
Xizang (Tibet)	1982-86	1.69	ICIMOD, 1990a
W. Sichuan	1950[5]	0.97	
	1960[5]	2.62	Chen Guojie et al. 1992
	1970[5]	2.38	
	1980[5]	1.44	
Myanmar			
Kachin	1973-83	2.1	Mishra, ICIMOD, Internal Document 1986
Chin	1973-83	1.3	
Shan	1973-83	1.6	

A direct consequence of the rising population growth rates has been a rise in the labour force. In many countries, the labour force has been rising at rates higher than the population growth rates. For example, in Himachal Pradesh and the U.P. hills in India, the growth rate in the 1970s was about 2.5 per cent compared to the population growth rate of 2.1 per cent. In Nepal, during the same period, the average annual growth rate in the labour force was 3.51 per cent. The NWFP in Pakistan is perhaps the only case in which the growth rate in the labour force has remained lower than that of the population, mainly because of the declining participation rates of women in the labour force. Even in the Hengduan Mountains of West Sichuan, the labour force growth rate during 1975-85 was estimated to be 2.3 per cent compared to a population growth rate of about 1.5 per cent. In most cases, however, the high growth rates in the labour force have been a result of overall increase in participation rates and the increasing entry of women into the labour force. It may also be noted that, with a few exceptions, such as the NWFP in Pakistan and the Chittagong Hill Tracts of Bangladesh, the labour force in most of the HKH comprised about 40 per cent of the population.

This growth in the labour force in many of the mountain areas of the HKH has not been accompanied by a transformation in the structure of employment, and, as a result, the high dependence on traditional agriculture has continued. In the Indian Himalayas, over 60 per cent of the active labour force was in agriculture in the 1970s. Only slight declines are visible in the 1980s. A similar situation prevails in the NWFP in Pakistan and the Chittagong Hill Tracts in Bangladesh. Nepal and Bhutan can be characterised as agricultural economies *par excellance*. In rural areas of West Sichuan, agriculture is as important as in Nepal or Bhutan, since about 90 per cent of the labour force were reportedly engaged in the agricultural sector in the 1970s.

The perpetuation of conditions for population growth and the limited proportion of cultivable land have meant that the per capita availability of land has declined over the years (Table 3). At the same time the quality of available per capita cultivated land has also tended to decline as more and more marginal lands are brought under cultivation. As the pressures on available resources have intensified deforestation to meet the demands for arable land, fuelwood, and fodder, has been extensive (Bajracharya 1983). Pastures and grasslands have been overgrazed. The imperatives for adaptation have consequently led to use of inferior options in farming systems (Jodha 1990). ICIMOD studies in a number of areas in Nepal show that the indicators of unsustainability of the farming system have multiplied over the years (Shrestha 1992). Meanwhile the scope of traditional escape mechanisms, such as migration, has been more restricted because of the evolution of rigid national and regional political boundaries. Intensification of agriculture, another traditional adaptation mechanism, has in most cases resulted in over-extraction and degradation of land resources. Poverty has been more pervasive and in a sense universalised.

While the unsustainability of mountain agriculture has intensified the demand for labour (Sharma and Banskota 1991), it has also induced a large number of people to migrate to more productive areas in the plains, or to urban areas, or to countries faced with labour shortages where there are seemingly more opportunities. Outmigration, due to a poor land base and lack of other employment opportunities, is a phenomenon evident in many countries/regions of the HKH. Between 1971-81 about 1.4 million people were on the move

Table 3: Per Capita Cultivated Land in Selected Areas/Regions of the HKH

Country/Region	Year	Per Capita Cultivated Land (in ha)
Bangladesh		
Chittagong Hill Tracts	1951	0.247
	1974	0.150
	1981	0.097
India		
Himachal Pradesh	1961	0.220
	1971	0.190
	1981	0.134
Jammu & Kashmir	1981	0.119
U.P. (8 districts)	1971	0.30
	1981	0.16
Sikkim	1981	0.272
Arunachal Pradesh	1981	0.177
Manipur	1981	0.098
Meghalaya	1981	0.144
Nagaland	1981	0.197
Bhutan	1980	1.04
Nepal	1971	0.173
	1981	0.133
Pakistan		
NWFP	1981	0.158
China		
Xizang	1960	0.150
	1982	0.105
W. Sichuan	1982	0.150

Source: Same as Table 2.

within and outside the province and the country in the NWFP in Pakistan (Nazeer and Al Zalaly 1992). Migration to the Gulf is an important source of remittances in the economy of mountain communities. Between 1971 and 1981 over 300,000 net lifetime migrants were recorded to have moved to the *terai* plains of Nepal. There is also

considerable migration for recruitment in the army in India (Gurung 1989). Districts like Tehri Garhwal, Pauri Garhwal, and Almora in the U.P. hills have been known for outmigration since the 1870s (Singh 1990a). Even in Tibet, urban-oriented migration is evident. The district of Lhasa is reported to be experiencing a population growth rate of over two per cent per annum. In much of China, including the mountain regions, migration, however, has been more or less regulated by State policies.

Outmigration is just one part of the migration scenario in the mountains. In areas where new opportunities are opening up, or prospects of such opportunities exist, immigration from the plains has also been remarkable. Such is the case, for example, in Sikkim and Arunachal Pradesh in India (Karan and Iijima 1984, Karan 1987). Hill towns of Himachal have grown as a result of migration and in many areas, such as the tourism sector, employment opportunities are being taken advantage of by migrants (Singh 1989). Seasonal migration to cash crop growing areas during peak labour demand periods is a recurring phenomenon in Himachal and in the U.P. hills. In the Chittagong Hill Tracts in Bangladesh, migrants from the plains comprise over 40 per cent of the population (Hossain and Bakht 1986).

The trends in population growth, the sluggish pace of the structural transformation of the mountain economy, and increased pressure on land resources clearly indicate that the latitude (in terms of carrying capacity) provided by the existing production regime under existing environmental conditions has been stretched to its limits in most of the mountain areas of the HKH. Poverty alleviation in such a context has therefore to address the issue that lies at the heart of poverty, namely gainful employment, in general, and off-farm employment in particular. It is this aspect, and the policy and programme response of the governments of the HKH region, that will be discussed next.

3. Policy and Programme Responses to Poverty Alleviation and Employment Generation

It has been indicated above that traditional mechanisms of adaptation to population growth and poverty have systematically been made irrelevant by forces (both external and internal) over which the mountain communities have very little control. How do the poor survive in such a context and how is poverty sustained, as it were, is therefore a relevant question.

Evidence from selected areas of the HKH region show that a surprisingly large number of households engage in off-farm activities to meet their subsistence needs. In many cases, however, the growth of such activities remains in the nature of distress activities reflecting "inferior", low paid jobs. Between a quarter to one-third of the rural household income in mountain areas is estimated to be derived from work away from one's own farm. This proportion is reported to be much higher among the landless and poor households (Singh 1990b, Islam 1983, Nazeer and Al Jalaly 1992, Bhattarai 1987, Khatry et al. 1992, Bora 1986, and Chen Guojie et al. 1992). A major source of off-farm earnings is wage employment in agriculture and is particularly more important for poorer, landless households. In many parts of the HKH, off-farm work is rooted in tradition and social sanctions such as the continuation of occupational groups like goldsmiths, blacksmiths,

carpenters, cobblers, potters, weavers, and so on. Much of the off-farm work takes place in highly dispersed, small-scale and informal settings and is often well integrated with agricultural activity. What appears to be true in the mountains is that it is the poorer groups for whom the imperatives for off-farm work are greater. Poverty alleviation has therefore to be seen from the perspective of gainful employment generation.

Major Policy and Programme Initiatives

A survey of available literature on employment generation and poverty alleviation in the HKH (Sharma 1992a) reveals a number of common concerns.

Improvements in Inaccessibility. Development policies in the HKH countries have emphasised inaccessibility as a major problem in mountain development. There is inevitably an infrastructural component to any programme for mountain area development.

The growth of the tea industry in Darjeeling and the horticultural revolution in Himachal Pradesh, India, provide examples of the positive linkages that can be enhanced through infrastructural expansion. With a few exceptions, such as that in Himachal Pradesh (India), government policies for infrastructural growth seem to have been based on the assumption that there would be automatic response to such growth. Experience suggests that this is not always so (Banskota and Jodha 1991). There are cases in which infrastructural expansion, particularly roads, has contributed to the demise of traditional crafts as noted in the case of the West-Central region in Nepal (Blaikie et al. 1977). Indeed, one of the major arguments for the regional development strategy in Nepal, proposed as far back as 1969, was the need to plan the roads as well as complementary and comparative advantage-based economic activities together (NPC 1970).

Self-sufficiency in Food Grains. Another common policy emphasis in the HKH countries until recently was the importance given to the attainment of food grain self-sufficiency, presumably to offset the problem of inaccessibility and the resulting high cost of transportation.

Agricultural intensification programmes in all of the hill areas of the HKH have been motivated by this concern. Such policies not only inhibited the generation of off-farm employment in general and non-agricultural employment in particular, but also had significant ecological impact since such policies encouraged the cultivation of marginal lands without significant gains in output.

The emphasis in recent years has been towards a policy advocating diversity of land uses according to ecological regimes. In some areas the successes have been spectacular as in the case of Himachal where the horticultural development strategy has provided a completely new basis for the development of the mountains as well as interaction between the mountains and the plains, although this strategy also has its own problems.

Rural Industrialisation. A number of HKH countries has also pursued policies aimed at rural industrialisation by promoting small and cottage industries, rural artisans, and crafts through a whole range of support services and subsidies.

These policies, however, do not seem to have made much visible impact on the occupational structure of the mountain population, and industries in the HKH mountains lack the characteristics of a leading sector in the regional economy. Potentials for small-scale industrial growth seem to lie in the areas of hydroelectric power production, forest-related products, horticultural processing, and mining - areas of relative comparative advantage in almost all areas and countries of the HKH. In most areas the backward and forward linkages of the industries with the rest of the mountain economy have remained extremely poor. This has been particularly true of the extractive industries like mining and timber and is exemplified by the situation in the NWFP in Pakistan and W. Sichuan in China. There are certain industries, tea for example, in the Darjeeling and Assam areas in the Indian Himalayas, in which, because of the nature of the industry, the employment effects are felt locally. Even in these cases it has often been found that a large proportion of benefits leak out of the mountain areas.

Integrated Rural Development and Poverty Alleviation. Particularly since the 1970s, Integrated Rural Development Programmes (IRDPs) have been conceived of as one of the major vehicles of rural development in quite a few HKH countries, notably Pakistan, India, and Nepal.

Poverty alleviation and employment generation are the two major objectives of IRDPs in India, and a number of programmes are targetted at small and marginal farmers, agricultural and non-agricultural labour, and rural artisans below poverty level. Most activities in such IRDPs focus on self-employment schemes for the poor and income-generating activities for families below the poverty line through subsidies from the government and loans from commercial banks. The major components of IRDPs in India have been the Training of Rural Youth for self-employment (TRYSEM), Development of Women and Children in Rural Areas (DWCRA), and wage employment programmes under the National Rural Employment Programme (now the Jawahar Rojgar Yojana and Employment Guarantee Scheme). These programmes were conceived at the national level and were expected to be part of a more comprehensive exercise on area-based planning. However, the latter element was conspicuous by its absence and in most cases there was insufficient planning of linkages and the institutional basis of IRDPs was weak. The preconditions (infrastructures, technology, marketing, etc) necessary for the success of IRDPs remained wanting. In addition, IRDPs covered only a fraction of the target population and, for the most part, did not result in a permanent increase of productive employment. The DWCRA also suffered from similar problems. Wage employment programmes had a predominant welfare orientation, did not contribute to asset creation, and leakages through contractors and middlemen were commonplace. Assessment of poverty alleviation programmes in general show that whoever else may have benefitted most from these programmes, it was not the poorest, or the most disadvantaged (Krishnaswamy 1990). It should be noted that the experiences in other countries of the HKH Region have been similar.

In some cases the IRDP strategy was based on the recognition of agro-ecological conditions, the historical backwardness of these areas, and their comparative growth potentials. The Indo-German Dhauladhar Project in the Upper Binwa Catchment Area in Himachal provides an example of the attempt at integration of the elements of ecological

balance through integrated, watershed level land-use planning for the satisfaction of the basic needs of food, fuel, fodder, and gainful employment (GTZ 1990).

In Pakistan the IRD programmes were initiated in the 1970s with the objectives of increasing agricultural production, diversifying the village economy, creating employment opportunities, and improving rural living conditions. The main problem with the programme has been the lack of consistency in policy over time and the lack of an appropriate institutional mechanism (Nazeer and Al Jalaly 1992). In Nepal, infrastructural expansion has been the most visible impact of IRDPs. The World Bank/UNDP Study, on the basis of a review of six IRDPs, concludes that none of the IRDPs could claim to have been very successful either in promoting rural employment in general, or in meeting the needs of the rural poor in particular (World Bank 1990). In most cases, the impact of IRDPs on enhanced employment and income generation has remained minimal.

In China, the issue of rural poverty in mountain areas is being addressed by the Leading Group for Economic Development of Poor Areas under the State Council. The major task of the leading groups is to organise, coordinate, and supervise economic development of poor areas. Poverty in rural China was recognised as a major problem in 664 counties and autonomous regions where the per capita net income was less than 200 *yuan* (China, OLGEDPA 1989). Most of the mountain areas in China fall under the Poor Areas category. Since 1986 the approach in developing poor areas has been guided by the principle of helping these areas to help themselves. The focus has been on targetting aid and services to the real poor. In addition to programmes for agricultural development and training in specific productive/potential areas, preferential policies are being pursued to facilitate the growth of rural industries that are labour intensive, agro-based, and have high value-added content. The policy is to create a situation where "the farmers can leave the land, but do not leave the countryside. They can become workers but do not enter the city". In spite of these policies, rural industrial employment has shown very sluggish growth in Chinese mountain areas, although non-agricultural sources are becoming more important in terms of the income earned by households, particularly after the introduction of the Household Responsibility System (Gao Hongbin and Ye Xingquing 1991).

Asset Creation and Target-oriented Programmes. Almost every country in the HKH has comparable asset-creating or target-oriented credit programmes that are designed mainly to encourage and promote activities that go beyond traditional agriculture. Many of these programmes tend to promote off-land activities. The Small Farmers' Development Programme (SFDP) is a target group focussed credit programme in Nepal based on group liability and savings and intensive technical support. Most credit goes to the livestock sector. A similar programme, but targetted to women, is that of the Production Credit for Rural Women (PCRW). The Intensive Banking programme is another programme of extensive lending to low income households in the priority sectors of agriculture, cottage industry, and services. Several subsidy-based programmes are also in operation. But evaluation after evaluation of subsidy-based programmes in general show that it is not the target groups who are benefitting from these subsidies (NPC 1992). In Pakistan, credit at low interest rates is provided through programmes such as the Small Industries' Development Board and Pakistan Industrial Credit and Investment Cooperation. Similar low interest credit programmes exist in India. In China, particularly after 1980, a

number of specific programmes is being implemented in the mountains of W. Sichuan. The Capital Aids Programme provides funds for development of the non-farm sector in mountainous areas. The anti-poverty programme mentioned above provides assistance to rural enterprises in designated poor areas. Under the Special Financial Policy, low interest loans are provided for development of the mountain regions. However, there are very few examples in which such programmes have induced large-scale transformation of the labour force from primary to secondary occupations.

Human Resources' Development. Human Resources' Development is another policy and programme area to which some attention is given in all HKH countries. Other than regular vocational training, a number of programme-related training courses are provided in almost every country. The Rural Artisan Programme and the Training of Rural Youth for Self Employment Programme in India; training through the Small Industries' Development Board and Youth Investment Promotion Schemes in Pakistan, training through Labour Training Centres of the Department of Labour, through the Cottage and Small Industries' Programme and the Women's Development Programme, as well as Training for Rural Gainful Employment (TRUGA) in Nepal; and the Spark Programme in West Sichuan, China are all examples of programmes for skill formation and development of technical knowhow. In all cases, however, the major problem has been of training in areas where comparative advantages are evident in the locality. The link between training and conditions for employment in the area (including access to credit, tools of trade, extension and support services, and marketing) has more often tended to remain tenuous. In this context, the innovative activities of an NGO, the Aga Khan Rural Support Programme (AKRSP), need particular mention because training under AKRSP is invariably linked with on-going local development activities and is motivated by the objective of making programme areas self-reliant in terms of trained local manpower in extension, maintenance, and other skills.

Direct Employment Creation. In some countries, notably Pakistan, India, and Nepal, there are also direct employment creation programmes. The Food for Work Programme in all three countries; the Employment Guarantee Schemes in India; and the Special Public Works Programmes in Nepal and Pakistan are examples of direct employment creation programmes. In most cases, however, these programmes have had small coverage and are target-oriented. The impact, therefore, is quite limited. Further, many of these programmes have not been able to create sustainable employment.

Economic transformation in the mountains implies a shift from low productivity, distress type, and subsistence-related activities to those that have a higher level of productivity and value-added, are based on comparative advantages derived from local resource endowments, enhance the management and utilisation of mountain resources, and ensure that mountain people become the net beneficiaries of development programmes. Such shifts are fundamentally relevant for poverty alleviation and for sustainable use of natural resources.

An overview of extant policies on employment generation and poverty alleviation in the HKH reveals that such programmes have more often been conceived as residual and welfare-oriented programmes rather than ones designed to facilitate sustainable economic transformation in the environmental and resource context of the mountains. These

programmes have nevertheless served some very useful purposes. First, more development programmes (and investment resources) are being directed towards the rural and poor areas and groups. Second, service delivery mechanisms are being established in areas that were completely lacking in basic services. Third, through the experience of these programmes it is being realised that local receiving mechanisms that can articulate the needs of the poor and organise and manage resources, technology, and information are absolutely essential.

4. Implications of Mountain Specificities for Economic Transformation and Poverty Alleviation

A major lacuna of existing programmes is their weak responsiveness to mountain conditions (Jodha 1991, Banskota and Jodha 1991). Most often programmes and policies are imposed on mountain environments and economies without tailoring these programmes to fit mountain conditions. The result has been a multitude of programmes that promise much but deliver little in the way of an economic transition in mountain areas.

Mountain specificities have a number of implications for employment generation and poverty alleviation policies and programmes.

The *inaccessibility* factor, for example, can be modified through emphasis on high-value, low-bulk products or activities that take advantage of relative inaccessibility. In the mountains, however, infrastructures, particularly roads, have to be perceived in terms of the "level" and "type" that are suitable in the fragile environment, affordable costs and the stages in the growth of exchangeable surplus. Modern communications can overcome inaccessibility through the provision of timely market information.

Fragility entails a low carrying capacity and the vulnerability of resources to rapid degradation in conditions of high intensity use. Emphasis on resource-centred production technologies, promotion of off-farm employment in environmental regeneration activities, and so on are areas that need to be explored in fragile conditions.

Diversity is manifest in a range of micro-environmental variations in resources and comparative advantages. Promotion of agriculture and horticulture-based farming systems at different altitudinal zones, for example, can be both a source of off-farm employment and rational use of land resources. Diversity also allows for different institutional and technological options.

Niche is the basis of relative or absolute comparative advantage and allows for specialisations up to a certain level. Emphasis on the harnessing of niche in the mountains has traditionally been limited, mostly to extractive activities like mining, logging, large-scale generation of hydro-electricity, etc; which have raised questions of environmental sustainability. Because mountain areas in general are extremely scale-sensitive, more attention needs to be devoted to harnessing niche, but on smaller scales. Collection/ processing of medicinal herbs, mushrooms, etc, promotion of mountain tourism (within carrying capacity limitations), and high value skill-based activities are some of the niche-related avenues that can provide off-farm employment to the poor.

Marginality in terms of income and employment relates to increased dependency and unequal terms of exchange and trade between mountain areas and the plains. Promotion and expansion of off-farm opportunities under such contexts can only be commensurate with decentralisation, resource reinvestment, and creation of conditions whereby the mountain areas and people become the net beneficiaries of development. This would require strengthening of local level institutions, so that they spontaneously create "barriers" to entry by plains-based big businesses, on the one hand, and at the same time create conditions for a more equitable exchange relationship with the plains, on the other.

5. Concluding Remarks

The present paper has highlighted the aspects of demographic and other changes as they relate to universalisation of poverty in the mountains. It was emphasised that this state of affairs has been a result of external and internal imperatives over which mountain communities have little control. It was shown that existing policies and programmes designed to address the issues of employment generation and poverty alleviation have, for the most part, been perceived as residual exercises with the consequence that the overall impact of these policies and programmes in bringing about economic transformation in the mountains has remained minimal. The major problem with existing programmes is that these have not been sensitive to objective conditions in the mountains. While a number of successful initiatives (on different scales) are underway, mainstream policies and programmes have learned little from these efforts.

In this context, a number of tentative issues with respect to population and poverty alleviation become apparent. Those are briefly posited here.

- Recent demographic changes in the HKH Region (which have been induced by forces both external and internal) have exacerbated the problem of poverty in the mountains. While population-related policies will have an important bearing on this issue, the sustainability of mountain economies will depend on the extent to which economic transformation is achieved in the mountains.

- Economic transformation in the mountains is contingent on the utilisation and management of mountain resources and creation of conditions (institutional and otherwise) so that mountain communities become the net beneficiaries of development.

- Mountain areas exhibit a number of constraints to development in terms of employment generation and poverty alleviation, but there are also a number of opportunities afforded by the objective conditions in the mountains. These can provide a guide for the type of employment-generating activities that can be sustainable. The focus of development efforts should therefore be on identifying such area-specific opportunities and creating preconditions for taking advantage of such opportunities.

- Large-scale employment generation, capitalising on local resource endowments, can alleviate poverty in the long run, but a much more local need, institution, and beneficiary-participation focussed approach is imperative as an initial step. While

the welfare programmes of the State will continue to be required in areas such as education, health, and extension, broad-based local institutions and organisations need to be induced and supported to deal with issues of poverty and employment at local levels.

- The economic transformation of mountain areas is going to be a relatively slow process. Sustainability of the mountain economy is going to depend, to a large extent, on the pace and pattern of the growth in small-scale secondary and tertiary sectors. The time lag required to realise the comparative advantages in these areas can also be expected to be considerable. Therefore, in mountain areas where the pressure of population is already severe, policies and programmes for relocating at least a part of the population to plains or urban centres also merit serious consideration.

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UNDERSTANDING ENVIRONMENT - POVERTY RELATIONSHIP IN THE FRAGILE HIMALAYAN REGION

An Introductory Framework

Jayanta Bandyopadhyay

1. The Himalayan Dilemma and Mountain Characteristics

Taking partial advantage of the natural resources of the Himalayas, human societies have flourished with a highly decentralised framework over the last few centuries. These societies maintained a very slow rate of growth in population and gradually extended their economic activities to most parts of the extensive land resources, e.g., grasslands and forests. Surpluses from the agri-pastoral economics of mountain societies, such as honey, ghee, paddy, millet, etc, were sold to the plains. Cash income was generally converted to gold and silver. Thus, surplus sale did not affect the level, or type, of consumption, or the drudgery that characterised mountain societies. With gradual increases in socioeconomic links and transportation between the mountains and the plains, this drudgery and low level of consumption were interpreted as poverty and scarcity. In this way the Himalayan region quickly became identified as an area in need of development assistance, following what has sometimes been described as the 'discovery of poverty' (Sachs 1992). On the other hand, some important changes in the consumption pattern started occurring when the products of the market economy in the plains entered into the mountain areas.

Any visit to the rural Himalayan areas today would visibly reinforce this picture of a changing pattern of consumption, poverty, and drudgery. In the more accessible mountain areas, where the fast growing population is already causing tremendous pressure on the limited land resources, this description may be more appropriate. There is no doubt that, in the last few decades, there has been a rapid population growth in most Himalayan areas. This has been possible mainly because of the availability of death-preventing health care in the mountains. For example, in the case of Nepal, the estimated crude death rate came down to 14 in 1981 from 27 in 1952. The crude birth rate remained constant at 40-42 during the same period (CBS 1987). The time needed for the population to double decreased drastically during the same period.

Similar trends in population growth have been observed in other Himalayan areas also. As a result, per capita land availability has gone down to such a level that the mountain people obviously cannot subsist on indigenous farming practices alone. For example, per capita land availability in mountain areas of Nepal is 0.13ha, 0.15ha in W. Sichuan in China, and 0.15ha in the hill areas of the Indian State of Uttar Pradesh. For the mountain people, adjusting to such a low level of land availability means a great increase in pressure on land, since the mountain economy, by itself, has little immediate options for diversification or off-farm employment. Thus, the once affluent, surplus-producing communities, within a span of a few decades, have become poorer and deficit in food.

While the solution to this problem of poverty at the present levels of population lies in a more intense and diverse utilisation of the Himalayas' natural resources and advantages, environmental instability, more often than otherwise, is triggered off by such an expansion or intensification of natural resource use motivated by short-term economic goals. The lack of a clear guarantee of ecological sustainability for possible economic options in the fragile Himalayan region is one of the reasons why Ives and Messerli (1989) described the present confusion as the 'Himalayan Dilemma'. The dilemma is rooted in the theory of a downward spiral of environmental degradation under the condition of a high population density in the Himalayan region.

There are a few important reasons why this state of dilemma has evolved and continues to exist on the question of economic development in the Himalayas. One important reason is that development interventions, especially in the mountains, have been largely designed and carried out without serious attention to the recent growing literature on development alternatives or to the concern for sustainability. Many of the economic interventions in the mountains, till recently, have been guided by the received model of development whose validity has repeatedly been questioned by many critics. As a result, ecological unsustainability and new socioeconomic problems have often been introduced into the mountains by these interventions originally aimed at the economic upliftment of the poor. This has carried on even when the growth model faced serious challenges from within the community of development professionals (Abt 1989; Adams 1990; Nerfin et al. 1975; Tri et al. 1986). In a more focussed work on sustainability, Goodland (1991) and Dali (1991) have further stressed the risks associated with blind acceptance of the growth model, if sustainable development is to be achieved. Tinberger and Hueting (1991) clearly show how the present concept of economic development, based on GNP considerations and market prices, is causing ecological destruction, which remains invisible in the short term. This aspect of the central problem of defining development is only briefly mentioned here. Within the limited scope of this paper the very large body of literature on development alternatives cannot be presented. In no way, however, can the importance of these emerging thoughts on development be underestimated in the formulation of mountain development strategies.

Apart from the very significant scrutiny which characterises the current literature on development, an equally important and related reason behind the Himalayan dilemma is that the theory and practice of mountain development have been applied with a strong "plains' bias" by outsiders and were not led by a deep understanding of the specific opportunities and constraints operating under mountain conditions (Bandyopadhyay 1991).

The dominance of the plains' bias in the programmes for mountain development generated among mountain scholars its dialectical opposite - mountain characteristics. Ives, Messerli, and Rhoades were among the earlier scholars to stress the need for the understanding of specific mountain characteristics (Ives and Messerli 1989; Ives, Hamilton, and O' Connor 1989; Rhoades 1990). Recent works of Jodha (1992) and Bandyopadhyay (1992c) have contributed substantially to the conceptualisation of this perspective. This recent discussion of 'mountain characteristics' has the potential of benefitting the process of evolving a holistic and interdisciplinary relationship of environment and economy specific to the mountains. These characteristics are important

parameters which distinguish the mountains from the plains in general, although individually they are not necessarily qualities of the mountains exclusively. Their significance is in their possible use in the interpretation of mountain environments and societies, or the design of future economic activities in the mountains that are more informed about and sensitive to the specific prospects and limitations of the mountainous ecosystems. In this way, the consideration of mountain characteristics is an important and probably essential input to any economic activity that is expected to be sustainable. In view of this a short description of the mountain characteristics is called for the various individual characteristics of the mountains have been probably dealt with separately by many scholars and researchers in different contexts. Considering the environmental, socioeconomic, and cultural characteristics of the mountains, Bandyopadhyay (1992c) has presented them in a single framework (See Page 50 of Vineeta Hoon's paper). This framework evolved from the work of Jodha (1990) as the starting point but differs with it on some basic concepts. In this framework the vertical formation is considered to be the only and primary mountain characteristic. This vertical formation, which is also sometimes referred to as the three dimensional landscape (Troll 1988), is the result of geological and geomorphological processes that raised parts of the Earth's surface much above the plains. This three dimensionality obviously results in the structural instability of the mountains, due both to the folds and fractures in the rock systems and simply because of the energetic instability of a vertical structure. The very tectonic processes that help build the mountains also introduce further fragility by imparting seismicity. Thus, structural fragility is an environmental characteristic of all the mountains, though the degree of fragility may differ. The vertical height of most mountains projects as a significant obstruction to global atmospheric circulations, imposing rather quick spatial variations in the climate across the mountain ridges. In addition to the macroclimatic changes that are caused by the mountains acting as climatic barriers, they also generate a very great variety of microclimatic conditions within the mountains. Accordingly, microclimatic variability is another environmental characteristic of the mountains in which temperature, precipitation, aridity, vegetation type, etc may vary within hundreds of metres of spatial distance. The third environmental characteristic of the mountains is their ecological complexity, which is a joint creation of verticality, fragility, and microclimatic variability. Ecological interlinkages in the mountains are complex and sensitive. Systematic information on their qualitative and quantitative nature is scanty for most mountains of the world, as the ecological processes become very different from those in the plains and need prolonged study to understand them.

In the identification of environmentally sustainable options for economic activities in the mountains, these environmental characteristics and their manifestations are important. Hence, some systematic understanding of these characteristics is called for. The structural instability keeps the mountain topography in an almost continuous process of geomorphological evolution with mass wasting, erosion, and sedimentation. This makes the mountains hazard-prone with threats of landslips, flash floods, earthquakes, etc. The combined impact of verticality and structural instability makes physical movement in the mountains difficult and risky, if not impossible in some cases. In this way mountains all over the world are characterised by a low level of physical accessibility, especially when mechanical systems of transportation are considered. The environmental characteristic of microclimatic variability is manifested through the climatic niche existing in the mountains, making specific mountain areas suited to specific activities like cultivation of

some medicinal plants, establishment of tourist centres, etc. This microclimatic variability, when considered over larger mountainous areas, then creates conditions for rich biodiversity. And lastly, the characteristic of ecological complexity generates a high degree of uncertainty over the ecological impact of human-induced interventions into the natural ecosystems.

The Environmental characteristics and their manifestations have largely shaped the socio-economic characteristics of the mountains over centuries. In the same way, future options for improvement in the economics of the mountain people may be found with the help of these characteristics. The hazard-prone and relatively inaccessible mountain areas provide the conditions for localised and decentralised economies. Due to the high cost of transportation, enforced by undulating topography and a resulting low feasibility of high-volume exchange, the mountain economies have so far remained largely marginal to the fast changing urban-industrial economies in the flatlands.

An important limitation is that of scale. In the mountains, morphological factors limit the scale of economic operations which need to be kept in mind while thinking of mountain development. Due to physiographic and ecological limitations, even non-resource intensive activities like tourism have also to be scaled down in many cases. With the extension of mechanical transportation systems, environmental niche and hydropotential in the mountains are becoming prominent mountain characteristics for intensive use. Water sports in the Himalayas, or skiing-based tourism in the Alps, are examples of such utilisation of mountain-specific niche. Equally significant has been the use of niche like climatic advantages in the transformation of mountain agriculture for the production of vegetables, medicinal plants, mushrooms, etc for the market in place of locally-consumed crops. All these specific advantages are, however, limited by the very low resilience against unsustainability in the mountains. Tourism in Nepal has damaged the sustainability of forests, cash cropping in the Indian Himalayas has reduced sustainability of farming through soil loss, and big dams in many places are at risk of being silted up at a far greater rate than expected, making them less sustainable. Prior attention to mountain characteristics, in this way, can be of significant help in the design of ecologically sustainable economic activities in the mountains and for the economic promotion of poor mountain people.

Mountain characteristics remain incomplete, as a tool for understanding the mountains, without due reference to the cultural characteristics. Like rich biodiversity, the mountains are also the home of rich cultural diversity. However, there are some threads of commonality in all these cultures, and they constitute the cultural characteristics of the mountains. Due to the vertical formation and limited use of mechanical power, most mountain areas are inhabited by hardworking people, in particular women. Mountain people derive their livelihood requirements from their immediate environment and thus have generated a good functional knowledge of their local natural resources. The relative geographical isolation of mountain communities helps to keep local community-based cultural traditions alive. The limited scale and dominant barter nature of the local economies generate the culture of austere living. These cultural characteristics are, however, those of mountain areas not significantly transformed under the influence of the homogeneous culture of the plains. These cultural characteristics can be important from the point of view of designing participatory development programmes which are sensitive to local capabilities and needs.

This brief introduction to mountain characteristics could be used in understanding the dynamics of the evolution of the relationship of environment and economy in the Himalayan region. These characteristics can indicate the specific environmental opportunities on which sustainable economic options can be based. On the other hand, attention to these characteristics can also enhance the early sensitivity towards the ecological unsustainability of the same economic activities. In this way, the degree of uncertainty about development interventions, both at the economic and environmental levels, may be reduced. Attention to a new direction on development alternatives, as well as concern for the mountain characteristics described above, can be helpful in reducing the uncertainties about Himalayan development and enhancing its ecological sustainability. In view of the fact that many parts of the Himalayas have not yet been transformed by the process of development, this region provides an excellent space for experimenting with new and sustainable economic interventions.

2. Accessibility, Marginalisation, and Mountain Poverty

Due to their verticality, the mountains have always been restrictive to easy human movement. Liberating themselves from this spatial limit imposed by the topography has always remained a fascination for mountain people. Every human being in the mountains wants to have access to larger spaces in a shorter time; take the injured or the sick to medical centres as early as possible; get away from the feeling of social and intellectual isolation characteristic of inaccessible mountain areas; take produce to the market, and bring in purchases at the earliest. Overcoming physical inaccessibility, in short, has been the starting point for socioeconomic transformation and the resultant changes in the Himalayan environment. Growth in accessibility of the mountain regions, on the one hand, enhances the spatial limits of economic activities on the other and results in intensification of resource use within the mountains. In the relationship of environment and poverty, this single factor of increased accessibility creates conditions for other characteristics to become fully operational. In this way, accessibility acts as the most important mediator between environment and economy in the mountains. In view of this, improvement of accessibility in the mountains, especially through roads, has become an objective of mountain development in itself. However, by merely enhancing accessibility can the present poverty in the mountains be reduced or eliminated on a sustainable basis? To answer this, a closer look at the role of accessibility from a political and ecological viewpoint will be needed in order to assess the relationship of increased accessibility, poverty reduction, and ecological sustainability in the Himalayas.

The continuous aspiration of the mountain people to have access to more space in less time began to be realised at an early stage, with the enhancement of accessibility in the mountains through the human ability to carve out, on the mountain slopes, tracks for the movement of humans and animals. Throughout the millenia mountain people depended upon human or animal muscle power to cross the mountains on such tracks. Beasts of burden, such as goats, sheep, donkeys, mules, horses, camels, and yaks, were the main instruments of accessibility in mountains like the Himalayas. Innumerable caravans of these animals and a large number of traders from both near and far overcame the rough mountain tracks and helped the growth of the trans-Himalayan trade between Tibet, on the one hand, and the Indo-Gangetic plains on the other, as well as across the Karakorum

and the Hindu-Kush. Information, either in written or verbal forms, also travelled with these physical movements. In the days before automobiles, the mountain tracks were the sole transportation paths and were of immense political significance. Political processes in this mountain region were largely motivated by aspirations for military control over the trading routes and thus for the right to collect taxes.

With the introduction of mechanical transportation systems, such as ropeways, roads, and railways, since the earlier part of the century, and airlines more recently, one of the most significant changes that has taken place in the Himalayas is the sudden scaling down of space - meaning a reduction in the time required for spatial movement. Unlike in the plains, where the growth of transportation technology has been somewhat gradual, starting from animal-drawn vehicles to automobiles, and from automobiles to aircraft, the history of transportation technology in the mountains is characterised by drastic discontinuities and jumps. The morphology of the Himalayas did not encourage the use of any animal-drawn vehicles, but, when road construction in the mountains was made possible in the earlier parts of this century, modern automobiles reached the mountain areas immediately. The technology jump is more immense, especially in places like Nepal where the technological gap between back-pack animal use and modern aircraft was suddenly bridged with the construction of a runway in a remote area. Similarly, in the case of communications, the introduction of modern telecommunication facilities, especially micro-electronics-based satellite communication technologies, has completely removed the time gap in communications between the mountains and other parts of the world. In the understanding of the long history of socioeconomic transformations in the mountains and in the design of future development interventions in these fragile ecosystems, this process of scaling down time and space can be of fundamental importance. The accessibility factor, in this way, is considered a vital link in the environment-economy relationship in all mountain areas. In a situation in which local resource use patterns, aimed at local consumption, cannot support the present population, enhanced accessibility may open up new resource uses and employment opportunities for the mountain people. For example, accessibility may directly encourage tourism that can take advantage of niche such as a salubrious climate and scenic beauty. It can bring in fundamental changes in farming systems' practices by opening up possibilities for growing high-value crops such as medicinal plants, fruits, vegetables, and so on, thus giving the farmers adequate purchasing power to import adequate staple food from the plains. It also opens up direct employment opportunities by making idle labour in the villages more mobile. In the case of mineral resources, or the hydropower potential, in the mountains, new road connections may initiate a totally new activity of high economic significance.

While accessibility can surely generate a significant push forward for socioeconomic transformations in the Himalayan region, studies on the relationship between enhanced accessibility and rapid socioeconomic transition have been carried out only recently. On the macro-level, Allan (1988, 1989, 1991) examines the cases of four major mountain roads constructed in the recent past, namely, the Kathmandu - Lhasa highway, the Srinagar - Leh road, the Karakorum highway, and the road across the Hindu-Kush extending northwards from Kabul through the Salang pass. The impact of the Siddhartha Rajmarg, a highway in Nepal connecting the mid-Himalayan town of Pokhara with the Indian foothill town of Nautanwa has been reported by Blaikie et al. (1980). Commenting on the major highways built in the South Asian mountain rimland in the last few decades, Allan

(1989) interpreted them as *"manifestations of geopolitical alliances on the mountain landscape"*. According to him *"the enormous costs of these roads could never be rationalised as mere economic development projects"*. It may undoubtedly be true that the basic decisions on the construction of these highways were not guided by economic development priorities. Yet, their availability did have significant socioeconomic fallouts. It is impossible to deny that the roads have led to enormous changes in the socioeconomic and cultural status of mountain societies in the Himalayas. Human aspirations in many parts of the Himalayas have become distinctly inclined towards having an ever-increasing hold on time and space - according to the norms of urban-industrial societies. In the present context, enhancement of accessibility can thus be taken as a necessary step for providing the base for economic upliftment of the interior Himalayan areas.

Accessibility, however, is by no means a sufficient step towards this. Transportation technologies provide the mechanical infrastructure for movement of people and goods. All connections may not leave a positive impact on the areas connected. As Jodha (1990) points out *'several entities acquire marginal status when they are linked with dominant entities on unequal terms. In several cases the mountain areas too pass through this process'*. A recent study of the impact of the Lamosangu-Jiri road in Nepal (SDC 1991) makes clear observations on the nature of this unequal linkage.

This (the road) has boosted imports of chemical fertilisers, construction materials, clothes, medicines, electrical and electronic goods, food grains, and other goods. But despite cheap transport, regional agricultural production did not increase enough to generate exportable surpluses except for seed potatoes and some livestock. So the deficit in the balance of trade has been growing for the last 15 years.

This insufficiency of increased accessibility and the associated risks of further economic degradation of the people is not merely a problem of the mountains. It is now generally termed "marginalisation", though there can be various types of marginalisation as described by Blaikie and Brookfield (1987). It is here that accessibility also activates the mountain characteristic of "proneness to marginalisation". In an analysis of environmental conflicts in the Himalayas and the emergence of important local movements, Bandyopadhyay (1989 and 1992a and b) identifies how through enhancement of accessibility, the risks of political and economic marginalisation of the mountain people and quick degradation of the local resource base by the State and the market become a real threat.

Accessibility provides the necessary base for the integration of remote mountain areas, both economically and politically, with the larger economies and the State. Whether the integration will be beneficial economically and ecologically for the mountains will depend on whether this link is mediated by marginalisation or not. Throughout the millenia, the optimised subsistence economies have supported a limited population with the limited local technologies used. Following the rise in population and rise in expectations of consumption, further quantitative intensification along the older economic routes will only ensure the continued degradation of both land pasture and forests. This is bound to enhance the misery and drudgery. However, this does not mean that the mountains have exhausted themselves ecologically or economically. What the above discussion on the dilemma and characteristics in the mountains leads to is that further economic potential

lies in both farming and non-farm economic innovations that are qualitatively different, and ecologically specific, searching for niche and using them in a more integrated but less marginalising economic framework. Thus, poverty and ecological degradation in the Himalayas may be seen more as the products of a particular economic and institutional arrangement. Increased population, when considered merely as a number of consumers alienated from the natural resources around them, can be seen as the destroyer of the natural resource base. Under a different institutional arrangement, the same people can be the best regenerators of the same resources when given both access to and responsibility for these resources (Bandyopadhyay 1993).

3. Mountain-specific, Legal Safeguards against Marginalisation

Mountain-specific legal safeguards should protect the mountain ecosystem from destruction and the mountain people from further marginalisation. This set of new institutional measures must also taken into account mountain characteristics and the ecology of the mountains. All these measures must, however, be supplemented by measures for population control and reduction. All these, though theoretically feasible, are not easy to achieve in practice.

Further, details of the institutional protection measures for the economic upliftment of mountain people are not within the limited scope of this paper and should form the starting point for a new discipline of the 'Law of the Mountains'. It should, however, be remembered that the fragile mountain ecosystem cannot sustain economic programmes aimed at following the consumption patterns and levels of the industrialised countries. The fact that northern income growth is not a solution to southern poverty problems (Goodland and Dali 1992), as well as the fact that northern income growth probably cannot be sustained without southern poverty, should not, however, be forgotten.

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ECOLOGY, RURAL PROBLEMS, AND SUSTAINABLE DEVELOPMENT IN THE TROPICAL ANDES

Christoph Stadel

Introduction

In the tropical Andes, the morphological and ecological conditions, the problems and needs of the rural population, and the strategies for sustainable development are closely linked interdependent factors. The remarkable variety and diversity of the relief and of the ecology of tropical mountains, both in the form of micro-regional niche and altitudinal belts, have offered the inhabitants a rich array of opportunities but have also confronted them with a series of constraints (Figure 1). This mix of stimuli and stressors has greatly influenced the living conditions of the mountain dwellers for centuries, has forced them to adapt their settlement forms and economic activities to the relief and to the ecology, but has also encouraged them to utilise and modify the geographical conditions to their advantage.

Development Scenario of the Tropical Andes

Vertical zonation is overlain by a "horizontal grid" of macro-, meso-, and micro-regions. At the macro-level, major regional contrasts can be observed from north to south, reflecting the latitudinal transition from the humid inner tropics to the semi-arid and arid margins of the tropics. The second macro-regional differentiation occurs along a transect of the Andes from the coastal plain and the interior fluvial lowlands to the exterior slopes of the mountain regions, to the inner-Andean basins and plateaux (*Cuencas, Altiplano*) and to the summit regions of the Cordilleras (Figures 2 and 3). This contrast in the ecology and human landscapes across the Andes can be very pronounced with major differences occurring sometimes over short horizontal distances. Distinct human environments represent primarily:

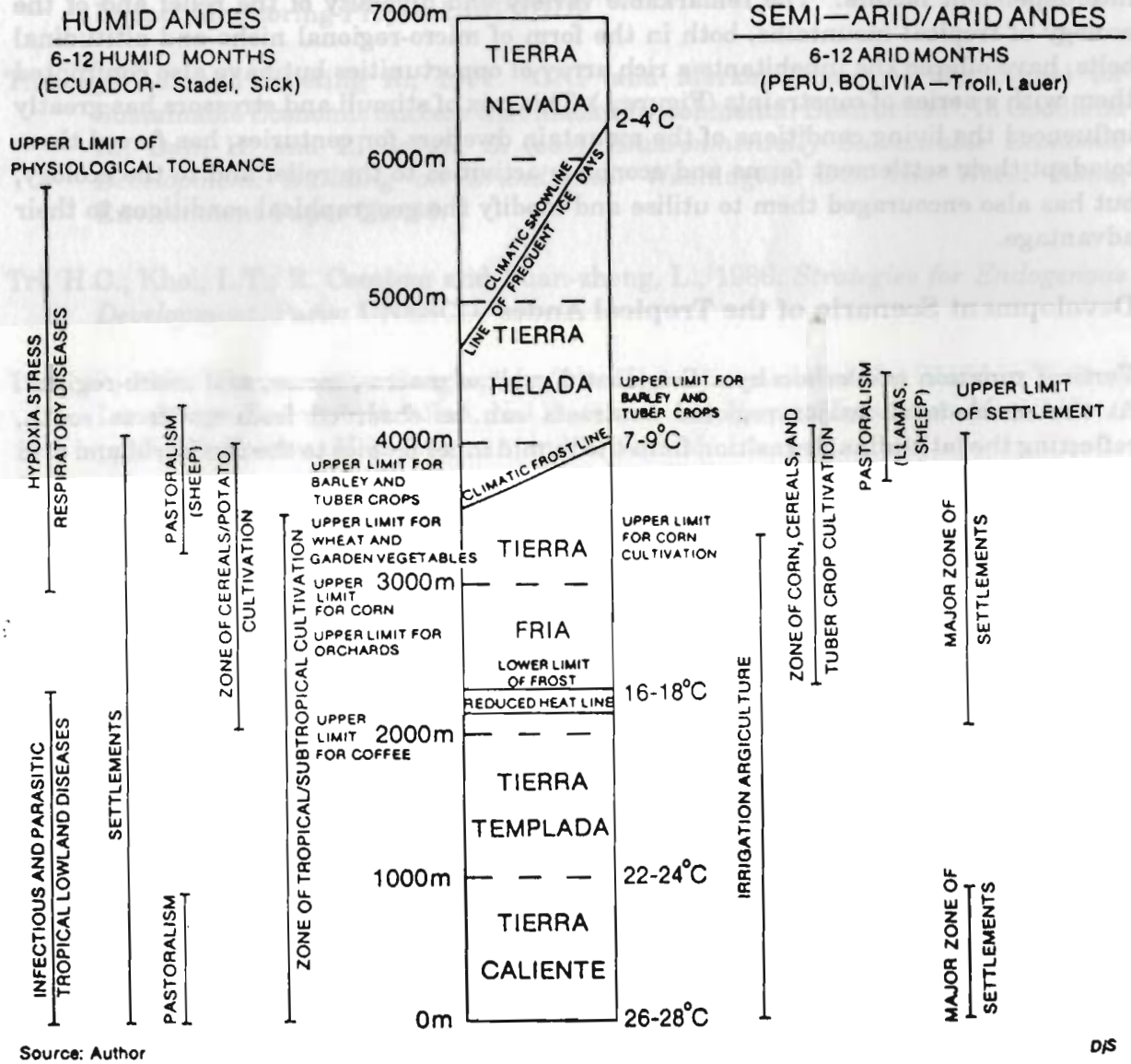
(a) the inner-Andean basins, plateaux, and valleys, the old settlement cores where the urban and rural structures in colonial times became modified and "mestizised";

(b) the more remote and higher mountain regions which are the principal "retreat areas" of the indigenous population, often socially the most traditional and economically the most marginalised regions; and

(c) the comparatively sparsely populated exterior slopes and foothill regions of the cordilleras whose attractiveness was for a long time curtailed by the constraints of a rugged relief, excessive humidity, dense vegetation (eastern slopes), arid conditions (western slopes in Peru and northern Chile), and inaccessibility. (However, the humid slopes in more recent times were increasingly opened up by roads which spurred not only the development of a pioneer agriculture and the foundation of new settlements but which stimulated also the migration and colonisation processes from the mountains to the adjacent lowlands.)

Figure 1

TROPICAL ANDES, ALTITUDINAL RANGE OF AGRICULTURAL ACTIVITIES AND SETTLEMENT



Source: Author

Figure 2

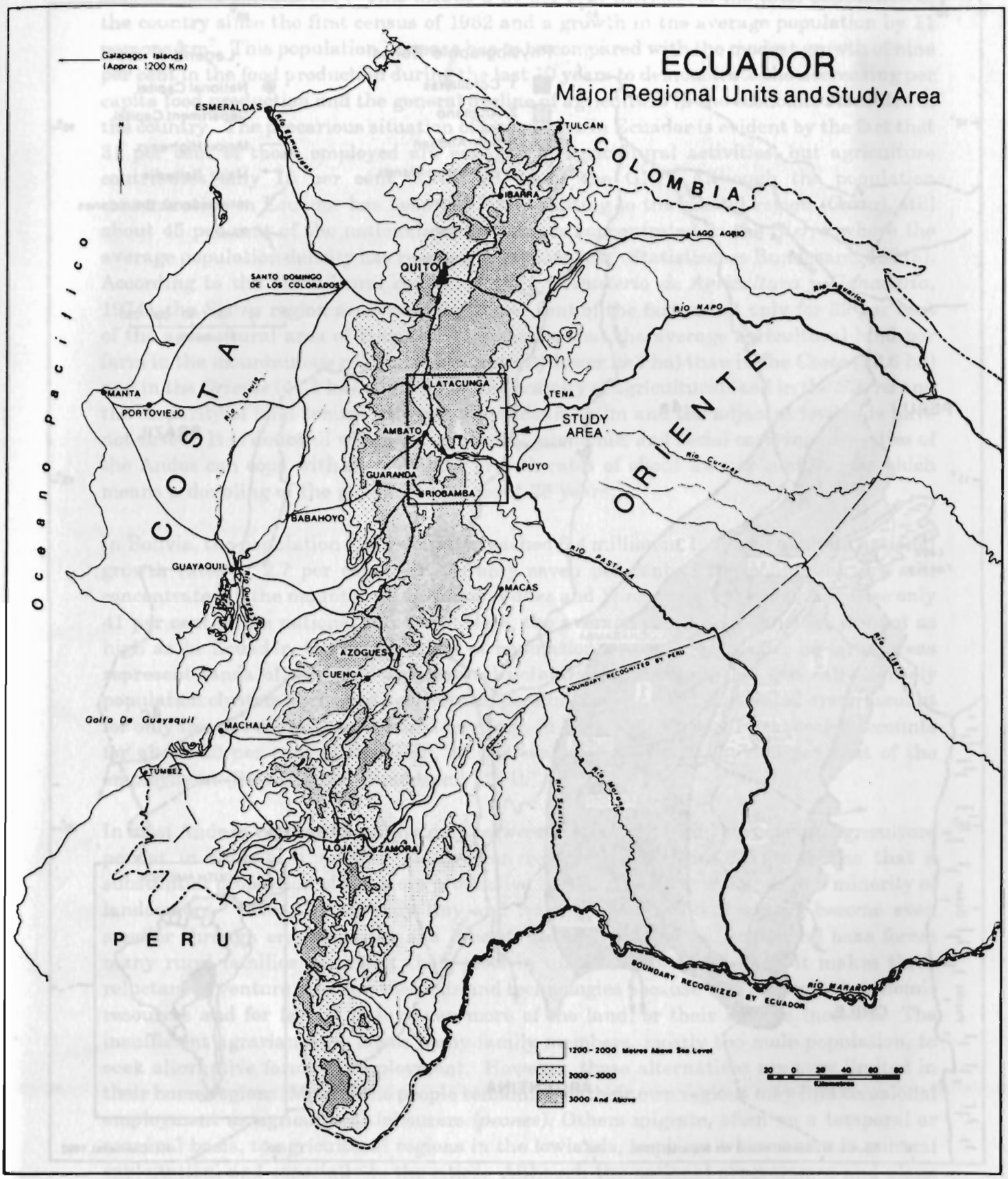
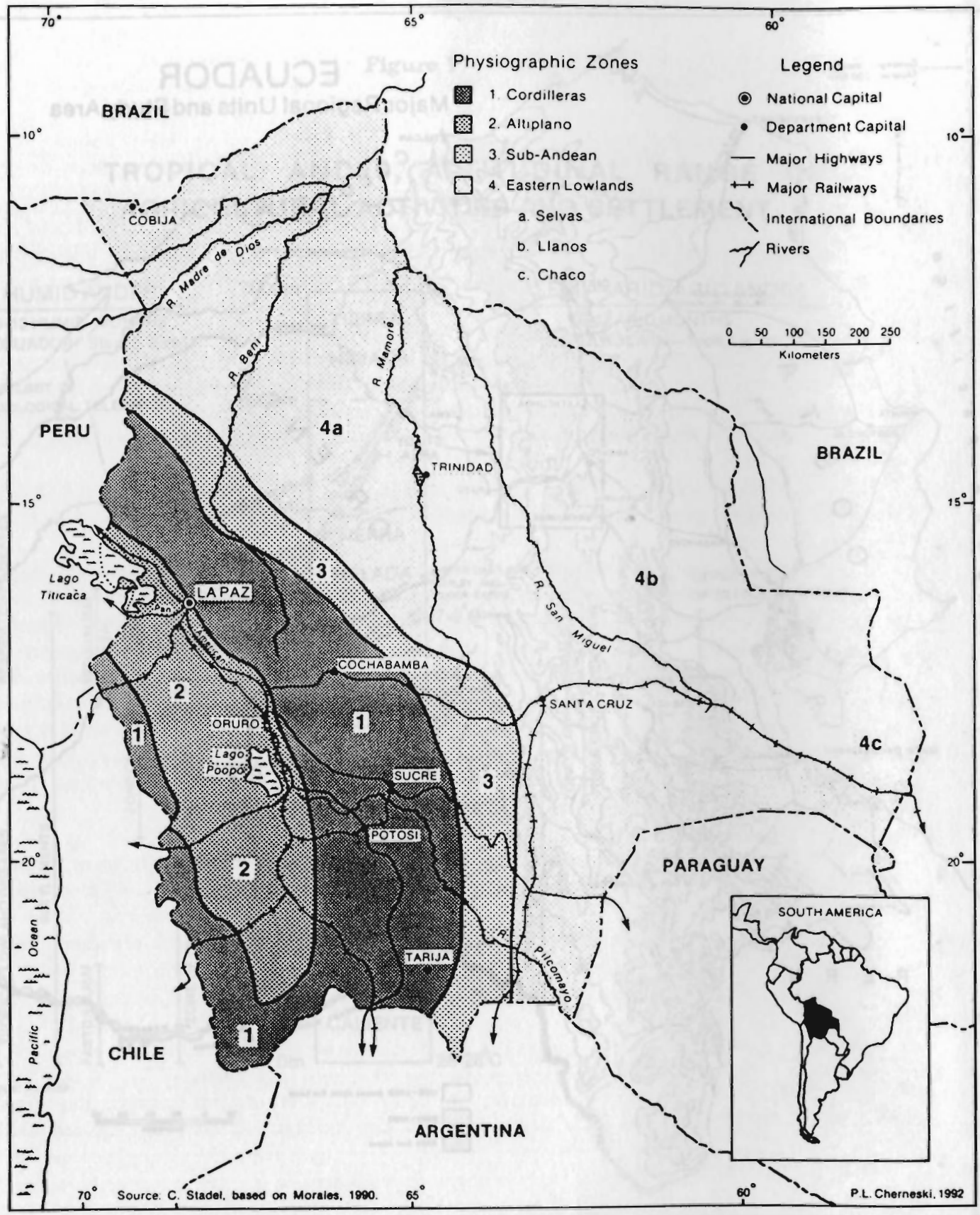

ECUADOR
Major Regional Units and Study Area
Galapagos Islands (Approx. 1200 Km)
ESMERALDAS
TULCAN
COLOMBIA
IBARRA
LAGO AGRIO
QUITO
SANTO DOMINGO DE LOS COLORADOS
RÍO NAPO
Río Aguarico
Océano Pacífico
COSTA
ORIENTE
MANTA
PORTOVIEJO
LATACUNGA
TENA
STUDY AREA
AMBATO
PUYO
Río Curaray
GUARANDA
RIOBAMBA
BABAHOYO
GUAYAQUIL
RÍO PASTAZA
MACAS
AZOGUES
CUENCA
BOUNDARY RECOGNIZED BY PERU
Río Tigre
Golfo De Guayaquil
MACHALA
TUMBEZ
Río Santiago
Río Morona
LOJA
ZAMORA
PERU
BOUNDARY RECOGNIZED BY ECUADOR
RÍO MARAÑON
1200 - 2000 Metres Above Sea Level
2000 - 3000
3000 And Above
20 0 20 40 60 80
Kilometres

Figure 3


BOLIVIA
Physiographic Zones
1. Cordilleras
2. Altiplano
3. Sub-Andean
4. Eastern Lowlands
a. Selvas
b. Llanos
c. Chaco
Legend
National Capital
Department Capital
Major Highways
Major Railways
International Boundaries
Rivers
0 50 100 150 200 250
Kilometers
BRAZIL
PERU
CHILE
ARGENTINA
PARAGUAY
BRAZIL
COBIJA
TRINIDAD
LA PAZ
COCHABAMBA
ORURO
SUCRE
POTOSI
TARIJA
SANTA CRUZ
Lago Titicaca
Lago Poopó
R. Madre de Dios
R. Beni
R. Mamoré
R. San Miguel
R. Pilcomayo
Pacific Ocean
4a
4b
4c
SOUTH AMERICA
Source: C. Stadel, based on Morales, 1990.
P.L. Cherneski, 1992

According to the latest estimates, 11.1 million people live in Ecuador at an average density of 41 persons/km^2. This means a 27 per cent increase of the total population of the country since the first census of 1982 and a growth in the average population by 11 persons/km^2. This population increase has to be compared with the modest growth of nine per cent in the food production during the last 10 years to demonstrate the decreasing per capita food production and the general decline of agriculture in the economic structure of the country. The precarious situation of agriculture in Ecuador is evident by the fact that 31 per cent of those employed are engaged in agricultural activities, but agriculture contributes only 15 per cent (1975: 18 %) of the GNP. Although the population concentration in Ecuador has been gradually shifting to the coastal region (*Costa*), still about 45 per cent of the national population are concentrated in the *Sierra* where the average population density has reached 80 persons/km^2 (Statistisches Bundesamt 1991a). According to the agricultural census of 1974 (*Ministerio de Agricultura y Ganaderia*, 1974), the *Sierra* region accounted for 62 per cent of the farms, but only for 39 per cent of the agricultural area of Ecuador. This means that the average agricultural land per farm in the mountainous region is substantially lower (8.3 ha) than in the *Costa* (18.6 ha) and in the *Oriente* (41.1 ha). Since 1974, the scarcity of agricultural land in the *Sierra* and the disparity of land tenure between the Andean realm and the adjacent lowlands have not eased. It is doubtful whether the natural, economic, and social carrying capacities of the Andes can cope with demographic growth rates of about 2.5 per cent / year, which means a doubling of the population in about 28 years.

In Bolivia, the population of the country reached 6.4 million in 1987 and exhibits national growth rates of 2.7 per cent/year. Seventy seven per cent of the population are still concentrated in the mountains (*Altiplano*, *Valles* and *Yunga* regions) which comprise only 41 per cent of the national territory. Here, the average population densities are not as high as in Ecuador, but the problem of population pressure does exist as large areas represent lands of marginal agricultural potential with only a few generally densely population clusters with good agricultural possibilities. In total, cultivated areas account for only two per cent of the national territory. In Bolivia, the agricultural sector accounts for about 20 per cent of the GNP, 10 per cent of the exports, but 45 per cent of the employment (Statistisches Bundesamt 1991b).

In most Andean regions, the dichotomy between a *Minifundio* and a *Hacienda* agriculture persist in spite of a number of agrarian reform programmes. This means that a substantial proportion of the more productive land remains in the hands of a minority of landowners. Often, the already tiny and fragmented *Minifundios* have become even smaller through erosion losses and inheritance divisions. This small land base forces many rural families to exploit their plots in unsustainable ways, and it makes them reluctant to venture into new methods and technologies because of their limited economic resources and for fear of losing even more of the land, or their meagre incomes. The insufficient agrarian base forces many family members, mostly the male population, to seek alternative forms of employment. However, these alternatives are very limited in their home regions. Most of the people remaining in their own regions may find occasional employment as agricultural labourers (*peones*). Others migrate, often on a temporal or seasonal basis, to agricultural regions in the lowlands, to places where there is mineral exploitation, and especially to the cities. Although the national programmes and plans of Andean countries generally proclaim the strengthening of the rural sector and the

support of small-scale farming as priorities, to date little progress can be observed in most agricultural regions.

Constraints and Development Problems in Rural Regions

1. *Different Stress Factors*

The agricultural potential and the rural living conditions in the tropical Andes are influenced and restricted by a number of conditions that could be described as natural or human stress factors. "Stress" in its wider sense is seen as a negative influence of environmental, social, and economic factors on the physical and mental well-being of people, as constraints on and degradation of the environment, and as a threat to the sustainable social and economic development of local populations and societies.

In the identification of stresses, a number of distinctions should be made.

(a) The distinction between constraints emanating from the natural environment and those resulting in human problems and deficiencies (Figure 4). However, a rigid separation of the two sets of stress factors is often not possible as environmental stresses are influenced and may be modified by social, economic, and political factors and *vice versa*. Also, some stress factors, e.g., the problem of isolation, have both an environmental and a socioeconomic component.

(b) The distinction between "endogenous stresses" inherent in the specific region or society and "exogenous stresses" impacting the region or group of people from the outside. Examples of "endogenous" stresses are the environmental problems of rugged relief or adverse microclimatic conditions, "exogenous stresses" are, for instance, interferences from governments, development agencies, or missionaries, with negative consequences.

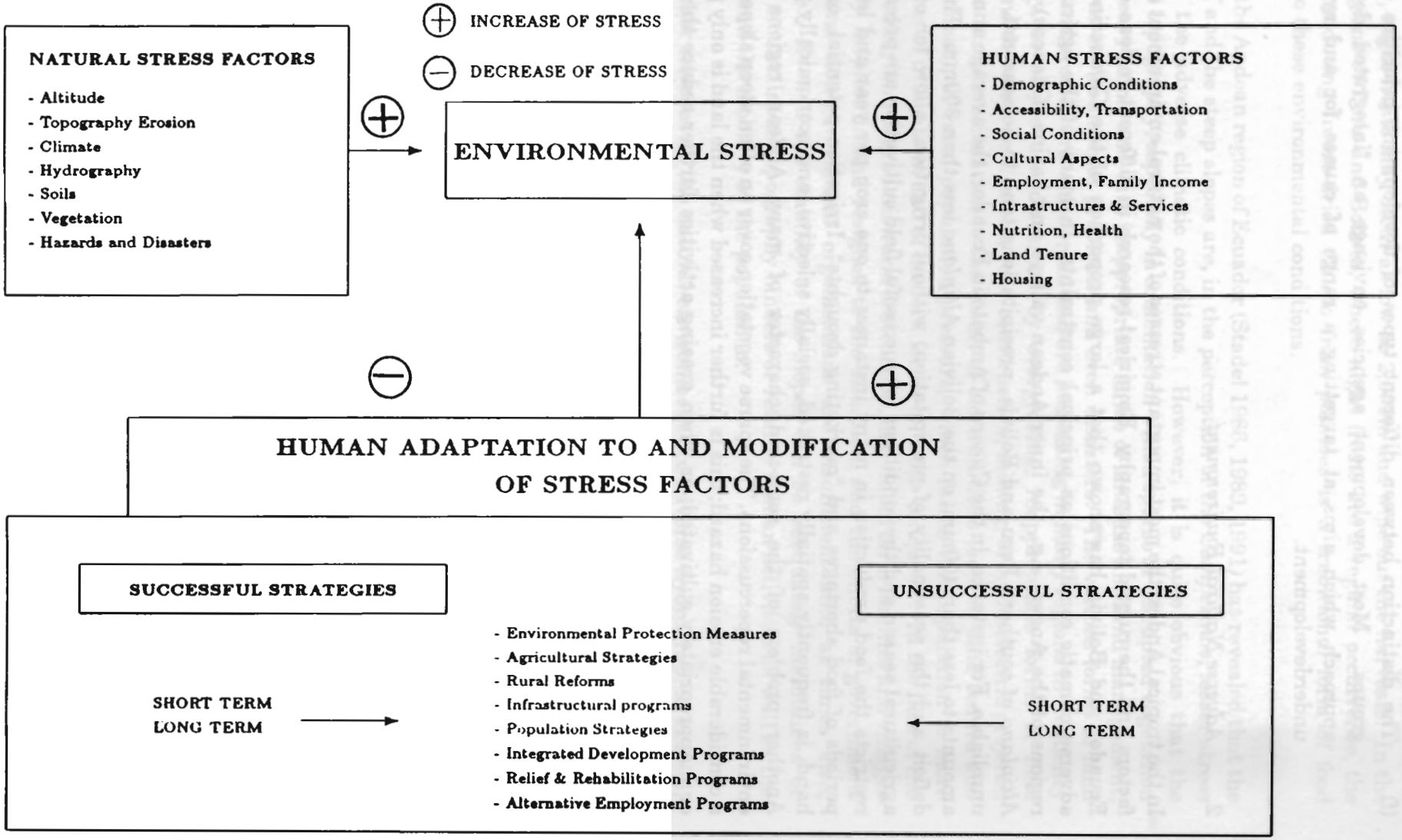
(c) The distinction between the perceptions of problems and needs of local populations, governments, and so-called national or international experts. These often divergent perceptions of the most urgent priorities have frequently created confusion, disagreement, and conflicts that ultimately led to unsustainable forms of assistance and to the eventual failure of development initiatives.

(d) The distinction between different segments of the population, e.g., age and gender groups, *Minifundio* - farmers, operators of *Haciendas*, new colonists, day labourers (*peones*), merchants and other non-agricultural employment groups, *Indios*, and *Mestizos*. For a long time, many of these people remained "silent", or their voices were not heard, in other cases they are still ignored, and development needs are identified by a minority of people for a minority of beneficiaries who are either more educated, more affluent, or more influential.

(e) The distinction between immediately felt problems and those that are likely to become a threat or stress in the future. The first set of problems, for instance an insufficient family income, requires immediate attention and is also likely to be a principal concern of the people; the second type of problem, for example land degradation, may only gradually become a stress, is often not perceived as a principal target for correction, and will necessitate a considerable amount of popular education and training (*capacitacion*) and a sustained development effort.

Figure 4

ENVIRONMENTAL STRESS AND HUMAN ADAPTATION TO AND MODIFICATION OF STRESS FACTORS



(f) The distinction between different types of development priorities and target groups. Most development agencies envisage an "integrated development" approach which aims at targetting a range of causes for and symptoms of underdevelopment.

2. *Adverse Natural Environment*

In the tropical Andes, the most important stresses of the natural environment are climatic factors and the rugged topography. Empirical research in different regions of highland Ecuador and Bolivia has shown that a large proportion of the *Campesinos* perceive adverse climatic conditions as principal constraints. In many of the agricultural core regions of the Andes, e.g., the inner-Andean valleys and basins (*Cuencas*) and on the *Altiplano* of southern Peru and Bolivia, precipitations tend to be seasonal, scarce, and unreliable. For instance, in the *Cuenca* of Ambato in Ecuador, the average annual rainfall amounts to less than 400mm; on the Bolivian *Altiplano* less than 300mm. This moisture deficit and the seasonality of precipitation, without irrigation, allow for only a short agricultural season and the conditions for successful field cultivation are precarious. This restricts the food production in many instances to one crop per year and leads to long periods of food shortages and "marketing droughts". Irrigation potential, on the other hand, is frequently spatially restricted, socially selective, and economically prohibitive. Another problem of the semi-arid character of many Andean regions relates to environmental repercussions. The sparse vegetation cover on often steep slopes generates a considerable erosion hazard; this is further increased when the land is only periodically or inappropriately cultivated, or when grazing activities further reduce the vegetation cover.

In the tropical Andes, the transition from semi-arid to humid, or even very humid, regions is abrupt. This contrast is particularly noticeable in the eastern *cordillera* regions where the western flanks towards the interior basins and plateaux are semi-arid and the eastern flanks towards the Amazon Basin exhibit very moist conditions. Especially in combination with prevailing steep slopes, the torrential rains trigger off mudflows, rockfalls, and landslides that threaten settlements, roads, and agricultural fields. In a less dramatic fashion, the rains often hinder work in the fields and the mobility of the population, as many paths and roads become virtually impassable. Furthermore, excessive humidity creates problems in storing and conserving certain agricultural products. In the *Paramos*, the combination of humid and cold conditions leads to impairment of the health of the population, especially in the form of respiratory diseases.

It has been long recognised that the vertical zonation of temperatures in the tropical mountains generates opportunities in the form of agricultural niche, but that it may also limit the range of cultigens and agricultural activities. Thus, the isotherm of an 18°C average annual temperature has been labelled as the line above which a "thermal deficit" for successful cultivation of a number of crops exists. With increasing elevation, the length of the growing period increases and the annual number of harvests is reduced; in the *Paramo* regions, for instance, potatoes require a growing period of 8-12 months. Whereas Andean agriculture exhibits many forms of adaptation to these conditions, the hazard of frequently unpredictable night frosts ranks high as a perceived major stress.

Occasionally, night frosts may occur as low as 2,500m and wipe out the harvests. In the *Altiplano* regions of Peru and Bolivia, where night frosts are a regular occurrence, the practice of producing freeze-dried *Chuno* from potatoes is a traditional form of food adaptation to these environmental conditions.

Research in the Andean region of Ecuador (Stadel 1986, 1989, 1991) has revealed that the rugged relief and the steep slopes are, in the perception of the *Campesinos*, lesser stress factors than the adverse climatic conditions. However, it is quite obvious that the mountainous topography, especially in combination with a sparse or disrupted vegetation cover, with heavy rains, and with inappropriate forms of land use and land management, creates serious environmental problems and even disasters. The various forms of land degradation and erosion are widespread and are increasing in many regions in frequency and intensity as slopes are disturbed by overgrazing, inappropriate forms of field cultivation and forestry, settlement, road construction, mining, or hydroelectric projects. The excessive human utilisation is the result of old traditions (e.g., in land tenure and land management); of rural population pressure, which forces the population to more intensive forms of utilisation; and of modern forms of "slope conquest". In the face of the rapidly proceeding land degradation and destruction, individual farm families and villages are frequently helpless in and resigned to the situation, and the efforts of government institutions and non-government organisations are insufficient and, at times also, inappropriate. Even if the stability of the slopes can be adequately maintained or restored, the mountainous topography hinders or retards human activities as well as the accessibility and the mobility of the population.

Among the other stresses on the natural environment are adverse hydrographic and soil conditions which often limit the agricultural potential and restrict the choice farming land to a number of often small niche. Finally, the greatly reduced forests and shrubs have not only resulted in adverse environmental conditions but have also severely curtailed the availability and accessibility of the rural population to wood for construction and for fuel.

3. *Adverse Socioeconomic Factors*

Field research in the Central Sierra of Ecuador has indicated that the human problems and deficiencies are generally perceived as the more serious stresses compared to those emanating from the natural environment. The majority of the problems relate to the multiple symptoms of rural underdevelopment and the marginalisation of the population. These are the result of a corollary of factors, among them the long tradition of neglect, disdain, oppression, and exploitation of rural people; social, economic, and political inequalities and injustices in the countryside; over-exploitation of the resources, at times without maintaining a sustainable stewardship of the environment; and an increasing pressure on scant resources by growing populations.

In assessing the felt problems of the rural population in the Central Sierra of Ecuador, a distinction was also made between "actively" perceived stresses, i.e., problems which were spontaneously mentioned by the persons interviewed and "passively perceived stresses", i.e., problems which were only confirmed by the local population when confronted with a catalogue of 30 potential stresses (Chart 1).

Chart 1

Potential Stresses on the Rural Environment in the Ecuadorian Sierra

- Steep slopes, rugged relief
- Cold temperatures, night frosts
- Humid climate, excessive rains
- Dry climate, scarcity of water
- Loss of soil due to erosion
- Unproductive soils
- Poor accessibility to highways or markets, inadequate transportation infrastructure
- Crop and animal pests and diseases
- Shortage of agricultural land
- Land fragmentation
- Inadequate family economy, low incomes, high prices of consumer goods
- Inadequate community infrastructures and services
- Agricultural labour shortage
- Insufficient employment opportunities
- Inadequate rural credit systems, high interest rates
- Lack of technical assistance
- Separation from family members
- Insufficient knowledge of Spanish
- Inadequate housing
- Insufficient irrigation
- Lack of clean drinking water
- High cost of agricultural supplies
- Insufficient supply or high cost of home fuels
- Large family size
- New ways of life
- Traditional lifestyles
- Family problems or problems within the community
- Other problems.

Although considerable variations in the ranking of the major perceived stresses were detected, many of the principal problems were pervasive throughout the entire study region. One of the principal stresses is the insufficient family income of most rural people. Among the *Minifundio* farmers, most of the available plots are very small and have often been further reduced by inheritance subdivisions. This has forced farmers to overexploit the fields, which tends to result in exhaustion of soil fertility and in land degradation. Also, many members of farm families are underemployed. Furthermore, marketing the products provides small farmers with few alternatives for a decent income. In the more remote areas especially, families tend to sell their produce to middlemen ("intermediaries") who frequently exploit the dilemma of isolation, lack of knowledge of options in markets, or powerlessness of the farmers. Even when farmers do reach markets, they may have to sell their produce to "intermediaries". Prices also tend to be

low as farmers in the region generally sell identical products at the same time of the year and often do not have the possibility of storing their produce in anticipation of higher prices. Also, trips to market centres tend to be unreliable or costly. For the people without agricultural land, alternative jobs outside those of poorly paid agricultural workers are few. Thus many rural people leave their homes on a daily, weekly, seasonal, or permanent basis to seek new opportunities in other agricultural regions, especially on plantations, in mining, and, foremost, in urban centres. This, however, often leads to serious psychological and social problems related to a difficult adjustment process for migrants and also for family members who stay behind. Also, the outmigration deprives the countryside of the leadership of young and dynamic people.

Whereas incomes and wages are low in rural areas, the cost of living has been steadily rising. In the agricultural sector, these expenses include the purchase of seeds, fertilisers, pesticides, and implements. In addition, the road towards modernisation is paved with additional expenses for food, clothing, shelter, health care, education, and new forms of recreation. Whereas the older generation may still resist these trends, younger people are embracing the symbols of "progress" and modernisation, a tendency which may lead to serious conflicts between generations. The march towards modernisation has also eroded many traditional values, beliefs, material culture traits, and forms of life, and this threatens the social peace in rural communities. Furthermore, modernisation generates a growing awareness among rural people that their levels of formal education, of knowledge, and of technical training are inadequate for the betterment of their lives. Finally, the enhanced education levels, reduced isolation, improved communication, and participation have raised the awareness of rural people to their need for a community infrastructure and the necessary support of services to their family life and to their agricultural operations. Rural people also realise that governments have notoriously frustrated their aspirations and are reacting either with apathy and resignation or with anger and political action. In the identification of felt needs and priorities for infrastructure and services, rural people often have divergent views and some of the expressed desires may reflect prestige thinking and an imitation of urban values rather than of pressing economic and social needs.

Although birth rates in the Andean region have started to fall during the last two decades, population pressure in many areas is an issue of major concern for outside observers. Field research in Ecuador and Bolivia has, however, indicated that rural populations - with a few exceptions - do not consider large families a major stress factor, at least not as an avoidable problem. Children are often described as "gifts of God", as valuable workers and contributors to the family income, and as a support for their parents in old age. Furthermore, a combination of a traditional religious and moral value system and an incomprehension, or mistrust, of the goals and methods of family planning have contributed to the slow pace in curbing family sizes.

Sustainable Development in the Tropical Andes

Since the publication of the report of the Brundtland Commission "Our Common Future" (1987) the term "sustainable development" has become fashionable among scientists, politicians, development experts, and even economists. As this term is being used by different people and agencies to justify their goals, programmes, and strategies, little

unanimity exists concerning the interpretation of the term. The "World Commission on Environment and Development", in the Brundtland Report, defines "sustainable development" as an effort to solve the current problems of people without compromising the capabilities of future generations to fulfill their needs through their own initiatives. This definition assumes that social and cultural value systems as well as economic productivity and consumption should develop within a framework of long-term sustainable ecological, cultural, and economic parameters. But this rather general, all-encompassing definition has led to considerable debates over the priorities of development, e.g., what sectors or what population groups should be developed? within what time framework should the development take place? whether there should be development from within or one that is sparked by outside influences? whether certain development initiatives are indeed desirable? or whether it might be preferable to maintain the ecological, cultural, or economic "status quo"?

Advocates of the concept of economic growth relate sustainable development to the continuity and enhancement of an overall economic progress at the macro-level, carried out through improved ecological knowledge and management. But Barbier (1987) and many non-government organisations see sustainable economic development as concern with increasing the material standards of living of the poor and underprivileged at the grassroot levels.

For Bandyopadhyay (1992: 301-302)

> *"Sustainability needs to be defined in terms of the continued welfare of all. Sustainability becomes meaningless when survival is under threat. Accordingly, the nature of socioeconomic transformations, unequal access to resources, and localisation of growth resulting in wider threat to the survival of people in the hinterlands are all factors contributing to unsustainability in some form or the other. The roots of unsustainability may be a better starting point than simply the meaning of sustainable development. To locate the roots of unsustainability, it will be important to listen to the South".*

Others have argued that a genuine integration of ecological parameters into economic policy at the macro-as well as micro-levels ought to be the priority. According to Redclift (1987), sustainable development is concerned with meeting human needs, with maintaining economic growth, with conserving the natural capital, or with all these three goals.

Listening to the voices of the South and to *Campesino* families, and emphasising local environmental conditions, the social values and ways of life of indigenous populations and family resources as "heirlooms from generation to generation" (Davidson and Dence 1988) are increasingly recognised as desirable fundamentals for sustainable development. Since the 1970s at least, development practitioners have expressed concern about the distributional dimensions of economic growth and social improvements. In response to these concerns, development approaches were proposed to which the terms "community development", "integrated rural development", and "basic needs' perspective" were applied. These forms of development were seen to be rooted in local communities and democratic

institutions and were based on the philosophy of direct participation of development recipients in the identification, prioritisation, and solution of problems. The aim of these development initiatives was to shy away from direct financial assistance to the poor carried out in "top down" fashion ("Paternalism"). It was strongly felt that these forms of assistance had created expectations of a continuous free and effortless supply of goods and services that had generated a mentality of passive dependence on the part of local populations (*Clientelismo*).

The new approach to community and rural development is rooted in the concept of the worth of the individual, of the family, and of each community as responsible, participating members of society. It is designed to encourage self-help efforts, to raise standards of living, and to create stable and self-reliant communities with an assured sense of social and political responsibility (Holdcraft 1978: 10). In response to these concerns, rural assistance programmes now generally attempt to address a "package" of social and economic needs in prioritised form. They also stress the importance of local participation and the mobilisation of indigenous material and human resources at every stage of the development process. There is a growing recognition that

> *"despite their poverty, poor people possess substantial resources, knowledge, and understanding of their circumstances, the will and persistence to make things better, and a capacity to organise and mount collective action".*
>
> (Annis and Hakim 1988: 1).

It is hoped that this approach will energise rural populations and strengthen communal ties. Local communities are challenged to participate efficiently in the development effort, to set in place organisational frameworks that facilitate the interaction between development agencies and development recipients, and to establish mechanisms that guarantee the sustainability of the development effort.

It is widely recognised that sustainable development in the tropical Andes ought to have the double focus of alleviating the poverty of the population and of protecting or restoring fragile environments. Given the widespread marginality of the rural regions of the Andes, sustainable development cannot mean further encouragement of an uncontrolled exploitation of Andean resources to boost national or international economies while excluding the majority of local populations from the economic benefits, not to speak of leaving them with a heritage of degraded environments and disrupted social systems. Moral, social, and economic imperatives require that sustainable development be focussed on the isolated, ecologically threatened, and economically underdeveloped regions and should include the "silent", marginal population for whom life is barely sustainable on a day to day basis.

As the ecological conditions, the cultural traditions, the social structures, the resources, and the economic potential are highly diversified in the Andean region, the local environmental conditions, as well as the experiences, needs, and priorities of the autochthonous population should be built into the development process effectively and on a sustained basis.

"One response to pervasive poverty has been the design of local institutions to enable rural communities to mobilise their own resources to generate growth and improve the quality of life."

(Ruttan 1984: 393)

The history of Andean societies has revealed their awareness of the fragile mountain environment, their detailed knowledge of local resource utilisation, and their consciousness of sustainability. Thus, many development programmes, particularly of non-government organisations, are underlining the need to build on local traditions, to respect the needs of indigenous societies and to utilise locally available natural and human resources. This requires the mobilisation of these resources through a patient and skilful process of listening and learning from the *Campesinos*, through carefully designed education and training programmes (*Capacitation*), through incorporating traditional experience and wisdom, and through design and implementation of development initiatives in a climate of genuine partnership and democratic decision-making.

Through participatory community programmes, native populations are rediscovering the importance of caring for *Pachamama* (Mother Earth). Taking into account the emphasis on decentralisation; local autonomy; indigenous development approaches by grassroot non-government organisations; and the full utilisation of local organisational structures, resources, and technologies, the development work of the Canadian Agency Save the Children (CANSAVE) is that of a supporter and facilitator for Bolivian partner agencies rather than a promotor of their own projects. Through its partners, CANSAVE is focussing its development efforts on the least privileged populations and on the most marginal areas in four micro-regions in the Department of Cochabamba (CANSAVE n.d.). More specifically, CANSAVE pursues the following objectives for rural areas.

1. Generation of alternative forms of production and income opportunities.
2. Promotion of agricultural strategies and appropriate technologies to enhance both the self-sufficiency levels and market access of the rural population.
3. Priority assistance to small farmers.
4. Strengthening of *Campesino* organisations to fulfill the goals of self-determination and auto-gestion.
5. Improvement of nutrition and health.
6. Enhancement of formal and non-formal educational standards.
7. Improvement of infrastructure and services.
8. Advocacy efforts for the rights of underprivileged groups (e.g., children, women, *Indios*).
9. Conservation and rehabilitation of the environment.

In its development implementation, CANSAVE, through its partner agencies, pursues the following principles and guidelines.

1. Since successful community development requires an integrated approach, micro-development projects in several sectors are encouraged.

2. Core programmes are focussed on "productive" project activities, primarily in agriculture but also in health programmes. The target populations of the projects are the most marginalised Bolovians in urban and rural settings.

3. A strong emphasis is given to the development of the potential and the capacities of both the partner NGOs and the project recipients. Institutional development includes support and training programmes for partner agencies in administration and project implementation. A priority in every non-formal education programme is development of the human potential of the project beneficiaries.

4. CANSAVE stays clear of religious sectarianism and partisan politics while attempting to support popular organisations and base groups. Efforts are also made to link local community groups with larger popular organisations and cooperatives.

5. In the allocation of resources, CANSAVE encourages its Bolivian project partners to diversify their financial base ... . Where the resources of CANSAVE and its partner agencies are insufficient, cooperative arrangements with other institutions are sought.

(CANSAVE-BOLIVIA 1990: 13-14)

Most of the partner agencies of CANSAVE have adopted policies that are based on the mobilisation and use of local resources and development strategies that are compatible with the natural and cultural environment. The *Programa Accion Agricola Comunitaria* (PAAC) works in Ayopaya, a remote and dispersed community in the high-Andean region of the province of Cochabamba in Bolivia. The agro-ecological approach gives priority to local farmers' knowledge of their own ecosystems and to development and diffusion of soil conservation and agricultural technologies that are, at the same time, ecologically sustainable and replicable, economically viable, culturally acceptable, and socially appropriate. Encouraging the active participation of everyone, and by using innovative training methods, peasant communities are assisted in becoming more self-reliant through programmes aimed at increasing and diversifying local production and consumption. A second emphasis of this agro-ecological approach is the protection of the fragile *Puna* ecosystem through soil conservation methods, e.g., building terraces, sloping the farmland, contour ploughing, building water runoff canals, limiting the size of animal herds while introducing genetic improvements in sheep and alpaca, promoting the use of organic fertilisers, reducing the use of pesticides and insecticides, using ecologically sound cultivation techniques and optimal crop rotation, and following systems. The experiences of PAAC and other organisations have shown that populations will only adopt long-term, environmentally sound practices if there is proof that these practices can enhance farm yields and rural income levels. Peasants are the ultimate judges of grassroot experiments. "*For the Bolivian farmer, seeing is believing. The challenge for PAAC ... is to concretely demonstrate that economic goals are not necessarily incompatible with a sustainable environment*" (Martin Villaroel, Director of PAAC).

Like most other NGOs the *Centro de Comunicacion y Desarrollo Andino* (CENDA) in the Department of Cochabamba aims at giving local communities a greater measure of

autonomy in the management of development projects. In doing so, CENDA is highly critical of exogenous cultural influences, economic models, and agricultural technologies and strategies. CENDA is strongly committed to the maintenance and revival of traditional values, resource management, and agricultural methods. The agency works on the premise that the introduction of modern agriculture to the Andes, with its emphasis on productivity and market orientation, has advanced inappropriate and unsustainable forms of cultivation and has increased the fragility of the Andean ecosystems. Thus CENDA focusses its work on revival of indigenous forms of resource utilisation and cultivation techniques; on the safeguarding and improvement of native seed varieties; on promotion of sustainable forms of environmental management; and on methods of investigation, communication, and training that fully integrate the participation of local communities (Regalski and Calvo 1989).

Among the non-government organisations that have undergone a fundamental change in their development philosophy and approach is PLAN INTERNATIONAL One of their target regions in Bolivia is the impoverished northern *Altiplano* between La Paz and Lake Titicaca (PLAN INTERNATIONAL ALTIPLANO 1990). Until about 1986 its work was focussed on providing direct forms of financial and material assistance in a top-down fashion. Development relied heavily on exogenous concepts, expertise, and technologies, largely excluding local input and resources, and thus creating conditions of long-term dependence. After the failure of development efforts, PLAN INTERNATIONAL began to realise that

> "*despite their poverty, poor people possess substantial resources, knowledge, and understanding of their circumstances; the will and persistence to make things better; and a capacity to organise and mount collective action.*"
>
> (Annis and Hakim 1988: 1)

In the new bottom-up approach, local families and organisations are included at every stage of the development process, and *Campesino* communities are asked to commit themselves to participatory efforts in planning, decision-making, and problem solving, as well as in provision of time and resources. The role of the agency is now seen as that of a facilitator and professional and financial supporter for the self-development of communities.

In its development work, a number of obstacles and constraints have been identified by PLAN INTERNATIONAL. On the part of the personnel of the agency, a lack of awareness and sensitivity towards the cultural environment of the project, and of the social and economic traditions of local populations, may seriously impair the establishment of a climate of mutual trust and respect and thus may result in a lack of cooperation. Furthermore, in some instances, the organisational structure of the agency has acted as a "bureaucratic wall" between the regional headquarters of the agency, its field offices, and the local population. Also, whereas a consistent development approach, based on a continuity of programmes and personnel, is warranted, such a consistency may be lacking as a result of changes in development priorities and strategies, financial uncertainties, and the job mobility of the personnel.

On the part of the development beneficiaries, a mentality centred on hopes for "quick fixes" of the problems and for handouts, a total reliance on outside assistance, and unsustained levels of participation and commitment of local resources may be serious impediments for genuine long-term development. Furthermore, development work in a region is at times characterised by a "*vast, decentralised profusion of independent organisations, as if development were a rich spread of wild flowers rather than a cultivated field*" (Annis and Hakim 1988: 217). Agencies working in the same region and targetting similar populations often have divergent philosophies, objectives, and strategies, and may even compete with each other. This may lead to considerable confusion among the population, or to situations in which development beneficiaries may be tempted to exploit the agencies by extracting deals and concessions that may be detrimental to genuine development.

> *"Today there is an intricate coral-reef like of organisations among the poor. With seemingly limitless social energy, they die, are resurrected, and spawn new hybrids of old ideas".*
>
> (Annis and Hakim 1988: 211)

Conclusion

Since precolonial times, Andean populations have used the potential and the opportunities of a diversified, tropical mountain ecosystem. On the other hand, the tropical Andes represent a fragile environment with considerable limitations and dangers for human activities. Since ancient times, Andean populations were aware of the opportunities and constraints of the Andean environment and have attempted to adapt themselves to the conditions of this mountain setting.

Although the Andean population attempted to be self-reliant and developed indigenous forms of cultural expression and economic activities, they did not live in a hermetically enclosed paradise and proved to be open to exogenous influences. Although these influences from the outside were frequently disruptive and destructive, a number of introduced cultural elements were positive additions and were voluntarily and successfully adopted by the Andean people.

Today though, the tropical Andes are affected by serious ecological and human crises and are exhibiting most of the well-known symptoms of marginality and underdevelopment. In the face of overwhelming problems, widespread poverty, and ecological crisis, the discussion of and the search for sustainable forms of environmental protection and restoration and of human development are urgent tasks.

There is widespread recognition that, in any kind of development, the use and the mobilisation of local, natural, and human resources is crucial. The knowledge and experience of indigenous populations are extensive, yet this potential is often still an underutilised resource, and native talents and social energies are often ignored. The new approach and challenge in the development effort include the careful assessment of the relative strengths and potential shortcomings of the knowledge, experiences, and priorities

of both indigenous populations and outside people and agencies and entering into a genuine dialogue and partnership in a climate of mutual trust and cooperation. This has required a change in attitudes towards giving local populations a fuller share participation, responsibilities, control, and benefits from development initiatives. This mobilisation of local resources appears to be the best option for sustained stewardship of the environment and for long-term improvement of the living conditions of the population.

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RELATIVE POVERTY IN THE VILLAGES OF HILLY AREAS OF NIGATA, JAPAN - THE DEPOPULATION AND DECLINE OF AGRICULTURE

Tanaka Yosuke
Nakajima Kanji
Shi Minjun

1. Absolute and Relative Poverty

In any discussion about rural poverty, it is essential to distinguish between absolute and relative poverty. Absolute poverty indicates a food consumption level insufficient to sustain physical survival in a specific environment.

Changes in the nutritional status of the nations of the world show that conditions for the western countries have greatly improved, whereas conditions for Asian and African countries have still not been satisfactorily resolved.

In some monsoon-Asia countries, the supply of food (mainly rice which is the staple food) has improved substantially as a consequence of technological innovations, expansion in infrastructure, and development of the support services needed for rice production. This change has reduced the problems of absolute poverty and, with economic growth, the focus on rural poverty is now on overcoming the problems of relative poverty in these countries. However, it has been mainly the lowland areas that have benefitted most from these rice-production technologies. Many hilly or mountain areas have not benefitted and consequently suffer from stagnation and a declining performance in agriculture, resulting in increased levels of relative poverty in these areas.

2. Agriculture and Forestry in Japan

Japan has been successful in solving its food supply problem, although a large part of the foodstuff is imported. Self-sufficiency in food has gradually declined in Japan. The changing nature of trade in agriculture has resulted in new adjustments and many regional differences are becoming apparent. The greatest adverse impacts are evident in the hilly and mountain areas that are not only further away from central markets but also experience difficulties in exploiting the economies of scale in farm operations.

From a historical point of view, when farm work depended mainly on human and animal power, differences in the efficiency of farm operations between the plains and the hilly or mountain areas were not so serious.

During these thirty years, farm mechanisation has steadily spread to all the villages in Japan. In 1990, 98 per cent of the paddy was transplanted by rice transplanters and 99 per cent of the paddy was harvested by combines. At this stage, differences in the

productivity of farm operations in the hilly and mountain areas compared to the plains have become serious. Relative poverty and depopulation in the hilly and mountain areas in Japan are therefore closely related to farm mechanisation and its impact on farm productivity.

Firewood gathering and charcoal production were at one time the mainstays of rural incomes in the hilly and mountain areas. The replacement of wood and charcoal with electricity and gases has reduced the demand for firewood and charcoal, adversely influencing rural income-earning options in mountain areas.

On the other hand, the demand for timber has steadily increased. However, at present, as with agricultural products, large quantities of timber are being imported and domestic supplies account for only half of the total demand for timber. Prices of domestic timber were lower in 1985 than in 1975.

As a result of these changes, the opportunities for earning and employment generation from forest resources in the villages of hilly and mountain areas have also diminished.

3. Depopulation in the Hilly and Mountain Areas

Economic growth in the last thirty years has increased the economic gap between urban and rural areas and also between the hilly and mountain areas and the plains. In the hill and mountain areas, 77-89 per cent of the villages experienced a reduction in population. At the same time, the age of the population also increased. In 1990, 18 per cent of the population was 65 years and over in the hill and mountain areas.

Various indicators have been developed to monitor population changes in areas that have been known to be experiencing a decrease in population. This is important in order to design different types of development interventions and support services.

In 1990, 89 per cent of the villages and towns that had suffered a decline in population were located in the hilly and mountain areas. The villages and towns that were designated as depopulated areas accounted for 42 per cent of hill and 77 per cent of mountain settlements. Various types of subsidy are provided by the government to support economic activities in these areas.

Regarding agriculture in the hilly and mountain areas, a comparison of four typical villages shows that the number of farms and farm families is decreasing in all villages (Table 1). However, the depopulation trends are different. In Oshima and Otoyo, the depopulation rates are greater than in Takko and Nishiyoshino where changes are relatively small.

Takko in Aomori prefecture and Oshima in Niigata prefecture are cold in winter in the northern regions, and the farming systems are different. In Takko, the farmers have been raising beef cattle on hilly grasslands as well as cash crops such as garlic and tobacco. Livestock manure has helped to maintain soil fertility.

Table 1: Comparison of Four Villages in the Hilly Areas of Japan

Village	Takko	Oshima	Nishiyoshino	Otoyo
Prefecture	Aomori	Niigata	Nara	Kouchi
Zone	Northwestern Cold hilly areas	Hokuriku Snowy hilly areas	Kinki Steep hilly areas	Shikoku Steep mountain areas
Farming type	Livestock+cash crops	Rice	Fruit (persimmon)	
Proportion of cultivated land (%)	11	19	12	4
Proportion of forest land (%)	88	66	80	82
Proportion of man-planted forest .(%)	55	32	82	73
Income produced per household (Y.1000)	2619	665	2210	339
Income produced per 10 areas (Y.1000)	90	42	133	58
Income from produce per capita (Y.1000)	1575	890	1525	390
Specialisation index rice	0.66	3.30	0.01	0.92
Vegetables	1.22	0.25	0.43	0.72
Stuff crops	4.90	0.29	0	0.92
Fruit	0.64	0	10.08	0.63
Livestock	1.09	0.04	0.01	0.74
Changes in farms and in the rural population 1970-1990				
Farm	-14.55	-33.84	-25.50	-42.20
Farm family	-25.14	-45.56	-30.58	-55.87
Full-time and part-time I	-25.23	-77.04	-19.16	-60.58
Agricultural employee	-29.24	-67.04	-23.72	-59.67
Full-time farmer	-33.59	-78.29	-25.28	-68.08

Note: Part-time I; the incomes of farms depend mainly on agriculture.

Source: Agricultural Census: Statistics of Agricultural Income Produced, 1989

Nishiyoshino in Nara Prefecture and Otoyo in Kouchi Prefecture are similar in temperature but Nishiyoshino has a steep topography. In Nishiyoshino, the farmers have specialised in the production of fruits (persimmons). By contrast, in Otoyo, where farmers had undertaken sericulture in the past, we do not see any farming today.

4. Depopulation and Decline of Agriculture in Oshima

The village of Oshima is located in the hilly areas of Niigata Prefecture and is today a typical depopulated area. In the past paddy was grown on the slopes, using water from

the streams and small ponds. However, more recently the young people have left the village looking for employment. Exodus of all family members soon followed. Many of the former paddy fields are now covered with bushes and the rooves of the abandoned houses are covered with grass. Silence and loneliness hangs over the entire village.

The number of families engaged in farming has decreased over the past thirty years by 64 per cent. The rates of decline have varied by different age groups. In the 16-29 age group, it is 84 per cent and 97 per cent in the 30-39 age group. Among the 40-59 age group, it is 78 per cent. Changes in the 60 age group are almost constant and 60 per cent of families engaged in farming are in this age group. The ages of farming families in hill and mountain agriculture are therefore a very serious problem.

Depopulation trends are different in hamlets even within a village. In 1960, there were 27 hamlets, but now there are only 24 hamlets in Oshima. Three hamlets have vanished forever on account of a total loss in population.

Statistical correlation analysis was undertaken to test the relationships between different variables. Variables were classified as follows.

Depopulation indicators:

decreasing rates of households,
decreasing rates of farms, and
decreasing rates of farm families.

Natural conditions:

heights of hamlets and
level of snowfall.

Facility variables:

distance to the village office,
distance to the Agricultural Cooperative Office,
distance to the city (DID), and
access to Health Post.

Farming conditions:

decreasing rates of cultivated land,
cultivated land per farm (in 1970),
yield per ha, and
size of hamlet.

Table 2 shows strong correlation between the depopulated villages and the natural conditions, facilities available, and decreasing cultivated land. However, correlation between depopulation and size of hamlet or yield per ha is zero or negative.

Table 2: The Depopulation Factor by Hamlet

Variables	Average	Unit	S.D.	C.V.
Depopulation variables:				
decreasing rates of households	29.2	%	31.9	109.5
decreasing rates of farms	35.4	%	28.4	80.2
decreasing rates of farm family	46.5	%	26.2	56.4
Natural conditions:				
heights of hamlets	3.9	grading	2.1	54.7
level of snowfall	3.2	m	0.5	14.6
Facility variables:				
distance to the village office	5.0	km	3.4	67.3
distance to the Agricultural Cooperative Office	4.8	km	3.5	72.6
distance to the city	32.4	km	3.9	12.0
access to Health Post	21.0	km	14.5	69.0
Farming conditions:				
decreasing rates of cultivated land	34.9	%	24.8	71.1
cultivated land per farm (in 1970)	9.4	10 a	2.0	20.9
yield per ha	397.8	10 kg	32.9	8.3
Size of hamlet	41.7	house	27.9	67.0
Correlation coefficients				

Correlation Coefficients

Household	1.0000											
Farm	0.9682	1.0000										
Farm family	0.9511	0.9653	1.0000									
Height	0.5658	0.5696	0.6394	1.0000								
Snowfall	0.7093	0.7000	0.7828	0.8743	1.0000							
To Office	0.6669	0.6487	0.6462	0.7926	0.7072	1.0000						
To Coop.	0.6548	0.6321	0.6784	0.9060	0.8411	0.9433	1.0000					
To city	0.4144	0.4147	0.4597	0.7600	0.7605	0.6563	0.8039	1.0000				
First-aid	04989	0.4657	0.5416	0.4338	0.6294	0.2323	04263	0.5203	1.0000			
Size of hamlet	-0.2386	-0.1665	-0.0928	0.2575	0.1608	0.0422	0.1208	0.1075	-0.0464	1.000		
Cultiv. land	0.7852	0.7827	0.7275	0.1641	0.3293	0.3373	0.2607	0.1700	0.2615	-0.3266	1.0000	
Land per farm	0.3961	0.3454	0.3826	0.2185	0.2785	0.2289	0.2525	0.0319	0.4398	-03821	0.1801	1.0000
Yield per ha	-0.0390	-0.0454	0.0123	-0.2327	-0.1853	-0.2402	-0.1767	-0.1094	0.1686	-0.3570	0.0275	0.4160 1.0000

Furthermore, Table 3 gives the results of PCA analysis using the correlation matrix. The contribution rate of the first component is 57 per cent. The factor loadings of the first component imply that the natural conditions and availability of facilities are as important factors for depopulation as the farming conditions. The second component, whose contribution rate is 16 per cent, shows that the hamlet size factor does not play an important role.

Between 1970 and 1990, 275 ha of farmland were lost in Oshima and discussions with the farmers indicated that access to the farmland and the feasibility of mechanised farming are the most important factors for sustaining farming in the villages. In hilly and mountain areas, this is very difficult. On account of all these unfavourable factors, villages such as Oshima are rapidly losing their population.

Table 3: Principal Component Analysis of Depopulation Factors

	Component 1	Component 2
Contribution Rate of Component %)	56.8	15.9
Factor Loadings of PCA		
Depopulation variables		
decreasing rates of households	0.90	-0.32
decreasing rates of farms	0.88	-0.29
decreasing rates of farm family	0.92	-0.25
Natural conditions		
heights of hamlets	0.84	0.42
level of snowfall	0.91	0.23
Facility variables:		
distance to the village office	0.83	0.26
distance to the Agricultural Cooperative Office	0.89	0.32
distance to the City	0.72	0.39
access to Health Post	0.61	-0.19
Farming conditions:		
decreasing rates of cultivated land	0.58	-0.51
cultivated land per farm (in 1970)	0.38	-0.54
yield per ha	-0.10	-0.62
Size of hamlet	-0.03	0.75

Source: Agricultural Census 1970, 1990, and the village office.

5. Some Attempts to Improve Hill and Mountain Areas

In the hill and mountain areas natural conditions vary from hamlet to hamlet and from farmland to farmland. It is difficult to exploit economies of scale through mass production. However, if we can take advantage of the special situations and identify appropriate products, then the disadvantage can be changed to an advantage. In some of the villages, farmers are moving away from the specialised notion of a "one village, one special product" approach.

In Japan, rapid economic growth has resulted in overpopulation of urban areas and depopulation of rural areas. The residents in urban districts have lost touch with the natural environment. In many villages in the hill and mountain areas, recreation facilities using abundant natural resources are being promoted. In many cases, enterprises that are integrated sectors can be harmoniously developed by both the private and public sectors playing an important role in the development of hill and mountain areas.

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WOMEN AND SUSTAINABLE DEVELOPMENT IN HILLY AREAS: A CASE STUDY

Shiney Varghese

Introduction

In this paper, I would like to look at the implications of sustainable development for gender issues. I begin by specifying the theoretical relation between gender and sustainable development and go on to examine the workings of an NGO, the AKRSP(I), in the light of this understanding.

First, we need to be clear about what we mean by sustainable development. The overuse of the term has given an elasticity to it, so that it means different things to people from different perspectives. I would like to distinguish between two kinds of SD-- genuine SD and mainstream SD. To understand this distinction, we need to go briefly into history. By the late sixties, the environmentally disastrous consequences of the dominant model of industrialisation were becoming clear even to many industrialists. Thus, it is a significant and well-known fact that the famous Club of Rome report of 1972 was authored for industrialists. The disquiet which followed in the wake of the report laid the basis for the idea of SD as an alternative strategy. While there are complex definitions (one of the most comprehensive being that offered in the report of the World Commission on Environment and Development (1988), or the Brundtland Commission), possibly the simplest and most popular is that it is the process of meeting the needs of the present without compromising the ability of future generations to meet their needs. This understanding represents what one might call mainstream SD.

Another, and much less popular, understanding of SD has come from radical scholars. From quite early on, these scholars had warned of the problems caused by the strategies of development followed by industrialised and industrialising countries. In most of these countries, they pointed out, technology and growth-based development strategies marginalised poor communities, affected women worse than men, damaged the environment, and were in general exploitative (Mies 1978). As the environmental crisis deepened, they pointed out the limitations of mainstream SD (Lele 1991) and argued that genuine SD would be feasible only if radical political and structural reforms were carried out. Such reform, they recognised, was unlikely because the First World, and to a lesser extent the Third World, elites have too much at stake in the present world system, and these reforms would challenge that system in a way which mainstream SD does not. Genuine SD, according to these scholars, would emphasise the need to redress class and gender inequalities along with checking environmental degradation, for only such a strategy would be truly sustainable in the long run (Redclift 1987).

Scholars like Redclift see mainstream SD as a form of 'environmental managerialism' (Redclift 1987). Redclift describes environmental managerialism as an attempt to continue with old styles of growth, while minimising the ecological damage that is done in the process. But these strategies of minimisation are inherently unstable, for no

systematic effort is made to change the wider environment, which remains unfavourable to SD. Thus, for example, many First World governments call for SD while continuing with lifestyles and systems that cause environmental damage.

We would recognise from the above that most professional NGOs in the Third World practise mainstream SD. But these projects do also have their achievements: they sometimes do check environmental degradation in absolute terms and improve the ecology through their intervention. Often, projects proceeding from such an understanding of SD try to create micro-systems (as for example in agriculture) which manage to maintain a certain level of output without damaging *'the essential ecological integrity of the system'* (Jodha 1990).

Two conclusions flow from this understanding of mainstream SD. First, the microsystems created by project interventions may not necessarily be very stable in the long run, since they work in an overall environment which is not favourable to SD. Second, and more directly relevant to this paper, strategies for mainstream SD have no necessary correlation with issues of equity and gender. That is to say, for example, that, contrary to our instinctive belief, a mainstream sustainable development project can continue to have biases against women or the poor--the ecological integrity of a system can in principle be maintained to a significant extent even if it has such biases.

Women and Sustainable Development

Let us now turn to look at the question of women and sustainable development. There is great agreement amongst proponents of mainstream SD on the need to involve women--an emphasis which is especially strong since older development theories usually ignored women. There seem to be three reasons for the belated recognition of the role of women.

First, there is the extensive involvement of women with the environment. It is by now well-recognised that women, especially in Third World countries, are often more directly involved in the natural resource base than men. In several parts of Africa, women are the principal cultivators. In Asia and other Third World regions, women play a very major role in cultivation, equal to or more than that played by men. In addition to this, women play almost everywhere the major roles in other subsistence activities, such as fuelwood collection, the supply of water, dairying, or foraging, are often almost entirely their responsibility (Dankelmann and Davidson 1988; Agarwal 1988).

Secondly, as a consequence of this greater involvement in managing, producing, and extracting natural resources, women's knowledge of ecological processes is also usually greater. In their day-to-day work, they often draw on this knowledge to manage their resources in a sustainable manner. Indeed, in many places (most famously in the Chipko movement: see Shiva 1988), ecological degradation is closely linked to the marginalisation of women's knowledge as a result of increasing commercialisation. Ecologically sustainable development thus seemed more possible if women were involved.

Thirdly, women have been most directly affected, especially in Third World countries, by ecological degradation. Ecological degradation, as has been argued in detail, affects most the poorest communities, which depend directly on natural resources for their survival

strategies. Amongst such communities, women are the weakest section. Sometimes, the impact is direct. Thus, in several parts of India, the degradation of the environment and common property resources has resulted in women having to walk longer distances to collect fuelwood or to fetch water. In this sense, their workload has been increased (Centre for Science and Environment 1985). Similarly, the increasing privatisation of common property resources and their concentration in the hands of a few have meant that women can depend less on these resources (Agarwal 1988; Agarwal 1989). At other times, the impact is more indirect. Ecological degradation has led, in many parts of India and the Third World, to a decline in the agricultural output. As a result of this, poor communities have found it increasingly difficult to meet their basic requirements. Women, as the weakest section of these communities, are the worst affected.

An awareness of these factors influences the decision of many mainstream SD projects to involve women. In this form of environmental managerialism, the involvement of women, or the poor, is both an attempt to reach a significant target group and a pragmatic attempt to ensure the success of a project. However, they are here seen not as actors but as useful workers whose assistance may make a crucial difference to the success of a scheme. While these schemes may sometimes hold out practical benefits to women, it is important to remember that they most often do not, and are not intended to, challenge the gender subordination of women.

An illustration and elaboration of this can be found in the case study below. Here, I briefly trace the deterioration of the traditional ecosystem of the region under social, economic, and political pressures and then look at how conventional development initiatives by the State even accelerated this process of deterioration. In both these processes, emphasis is laid on how women were adversely affected. In the third section, we look at a successful mainstream SD project and then look critically at its implications for women.

The Deterioration of an Ecosystem

To begin the case study, let us look at the historical transformation of the ecosystems of the approximately fifty villages in which the AKRSP(I) is working. These villages form part of Dediapada and Sagbara *talukas* of Bharuch district in south Gujarat. The two *talukas*, situated at the end of the Western Ghats, are characterised by a hilly topography. Hill regions share, to a significant extent, the characteristics that have been identified as typical of mountain areas: they are often inaccessible; their ecosystems are fragile and vulnerable to irreversible damage, which can occur rapidly; and they are characterised by a great diversity or heterogeneity.

We know of the region from approximately the early nineteenth century. At the time, the two *talukas* were covered with dense forests. Combined with the hilly aspect of the territory, this imparted a remoteness and inaccessibility to the area. This inaccessibility formed the basis of the strength of the principal community, the *Bhils*, who lived there. Led by their chiefs, they raided the plains and returned to their safe hilly abodes.

In addition to these raids, the dense forests and rivers cutting through the region made possible a lifestyle that drew on a variety of resources. Thus, hunting was an important

source of subsistence throughout the year. During the summer, the *Bhils* depended on fishing. The period immediately after the commencement of the monsoons was one in which resources obtained by foraging were important. For three to four months in a year, they subsisted on the foodgrains generated by agriculture. The cultivation they practised was primarily of the shifting variety in which the trees and vegetation on a plot of land were felled and burned and the spot cultivated for three or four years before being abandoned. The low population density of the region made it possible for this form of cultivation to be maintained until the early nineteenth century without much damage to the forests or the ecosystem.

But transformations from the early nineteenth century onwards made this system more fragile. First, the consolidation of British power in the region surrounding Dediapada and Sagbara after 1818 led to several expeditions against the chiefs and *Bhils* of the region. The military technology of the British gave them an advantage that offset the advantage of inaccessibility formerly enjoyed by the *Bhils*. With British support, the plains' chief of Rajpipla, to which Dediapada and Sagbara nominally owed allegiance, strengthened his hold on the region. Thus, one dimension of the transformation was political.

Another dimension was economic. Already, by the late eighteenth century, timber merchants were beginning to enter into agreements with the chiefs of the region to extract timber from the region. In this extraction of timber, the *Bhils* participated quite enthusiastically, providing labour for the purpose. After the political subjugation of the region, this exploitation of timber was intensified. In addition to large-scale removal of timber through merchants, the *Bhils* of the region stepped up their traditional activity of taking headloads for sale to neighbouring market villages and towns. These forest-clearing processes, mainly by merchants, continued almost unchecked until Independence in 1947, since the Forest Department set up by Rajpipla State was quite ineffective. After independence too, timber merchants have continued with their extraction, while the Forest Department looks the other way.

This slow denudation of forests caused by the commercialisation of timber led to new pressures being put on the environment by the old practice of shifting cultivation. With less forest cover, shifting cultivation could damage the environment more easily. Simultaneously, because of the decreased forest cover, game became less abundant than formerly; the silting up of pools also made it more difficult to catch fish. In addition, demographic pressures in the region increased from the early twentieth century when there was a decrease in mortality. These factors led to the intensified exploitation of land by the agricultural community.

By the 1970s, the consequences of all these development were quite visible. On the one hand, the local resource base was no longer adequate to meet the needs of the population, and this was indicated by both directly visible changes and changes concealed by local responses (Jodha 1992). Thus, for example, the erosion of the thin topsoil had led to a decline in the productivity of the land and to several portions being rendered uncultivable. Also, there was increasing dependence on strategies like seasonal migration to generate the resources necessary for household units to continue their subsistence in the region. Thus, the local economy and subsistence practices were no longer sustainable.

The implications of these developments for women were negative. Traditionally, women in hill communities, like those of the *Bhils*, had greater independence than did women in plains' societies. But this is true only in a relative sense: we should not make the mistake of assuming that the traditional system in Dediapada was egalitarian as far as women were concerned. Like most societies, the *Bhils* of Dediapada and Sagbara shared a patriarchal structure in which women were largely excluded from political power, had little independent access to economic resources, and were the victims of much male violence when their actions transgressed the norms of acceptable behaviour.

The crisis of the ecosystem because of commercialisation did not lead to the increased exclusion of women from economic or political power, but it did increase their workload significantly. As traditional sources of water sometimes dried up, or new villages were perforce set up at greater distances from sources of water, women had to walk greater distances to get water, their traditional responsibility. As firewood became less abundant, women had to work more to collect it, since this was another responsibility traditionally carried out by them. In agriculture, the workload of both men and women increased because of the more intensive labour that was now required to obtain the same output as formerly (see Varghese 1993 for an account of a similar crisis of the ecosystem in a nearby region, the Dangs, again inhabited by *Bhils*).

State Initiatives and Their Inadequacy

In independent India, the State took up many initiatives for the 'development' of Dediapada and Sagbara. There were several specific reasons for this, in addition to the general ideology of 'development' which we noted in the beginning. First, the two *talukas* were dominated by 'tribals', a group thought to specially need development inputs. Second, by the criteria of development, of all the 195 *talukas* in the State of Gujarat, Dediapada is the least developed and Sagbara is the fourth least developed. Thus, State agencies allocated and continue to allocate a substantial percentage of their budget for the development of these areas. Let us evaluate these initiatives in three important areas: land, water, and forests.

The most common project undertaken in the area of land development was that of cutting and terracing the agricultural land. Ostensibly this was meant to check the erosion of topsoil in a hilly area. Local government officials (seeking to fulfil targets set for them from above) coaxed the *adivasi* farmers into joining the programme on a 50 per cent loan, 50 per cent subsidy basis. Yet, the terracing was carried out without any regard for the specificity of the hill ecology. The inappropriate terracing thus ended up reducing the productivity of the land in a few years. Also, the levelling of land without accompanying inputs to farmers for cultivation led, in some cases, to increased erosion instead of checking erosion as it was meant to. Indebtedness in the region also increased, since cultivators, faced with declining productivity, had few means of paying back the debts that they had incurred. Thus, in the area of land development, the government initiative only helped to make the agriculture even less sustainable. It not only did not build on local knowledge bases, it made traditional agriculture difficult to practise by terracing and did not teach enough about terraced agriculture; also the terracing was done so badly as to actively upset the ecological bases of agriculture.

The government also intervened in the area of water resources' development, again with the apparent intention of improving productivity. The aim of these interventions was to introduce irrigated agriculture instead of rainfed agriculture. The two *talukas* are part of a medium to high rainfall area which has many perennial rivers. State authorities decided to use these rivers by tapping them for lift irrigation schemes. Several lift irrigation schemes were built in these two *talukas* on a 75 per cent loan, 25 per cent subsidy basis, and these were to be managed by the L1. cooperatives of *adivasi* farmers.

Again, the idea was sound but it was not thought through or adapted to the specificities of the area. First, there were the technical deficiencies. In setting up lift irrigation schemes in hilly terrain, many factors have to be taken into consideration, e.g., as the topography of the area or the amount of the land that can be effectively irrigated from a certain elevation point. Adequate attention was not paid to these factors. Second, there were the deficiencies from a social point of view. Not much effort went into developing the skills of the farmers to practise viable irrigated agriculture. Also, while the government had formally set up village-level, lift irrigation cooperatives, no effort was made to train the farmers in running the scheme through the cooperative after the project had been physically completed. Thus, in many cases, the scheme itself was a technical failure. In the cases where it functioned, the members found it difficult to practise irrigated agriculture viably enough to enable them to meet the running costs, let alone pay back the loan they had taken from the government in the process of setting up the scheme. On the grounds of the non-payment of the running costs of loans, district authorities stopped the schemes from functioning after a season or two. Thus, in this case, the water resources' development schemes of the government proved patently unsustainable, both technically and socially.

Another State initiative was in 'social forestry'. Around two decades before independence, large portions of Dediapada and Sagbara had been set aside as Reserved Forest. The access of local communities to these was limited. It was an offence to collect timber or other types of forest produce from these areas. At the same time, the massive exploitation of the forests by timber merchants, in collusion with the Forest Department, led to the denudation of forests, adversely affecting the local population. The forest plantations, which were undertaken by the Department, also paid no attention to local needs: commercially valuable species, rather than locally useful ones, were planted. But, until the seventies, this was not an issue for the Forest Department, as it claimed to be managing the forests for the 'national' interest as opposed to the needs of local communities.

The development of the concept of social forestry was a departure from this trend. It represented an effort to involve the local population in the planting and protection of trees on revenue wastelands or degraded private land near the village. The income generated in the process was to go to the people. Yet, despite this slightly greater awareness of local needs, there was still too great a gap between local communities and the Forest Department schemes which started in these villages in the late seventies and early eighties. First, many fast-growing commercially-valuable species, the environmental impact of which is much debated, were selected for planting. No attention was paid to the local timber or forest-produce needs. Second, there was no active involvement of the people in the schemes. Apart from the provision that they would get the revenue when

the trees were harvested (which they rarely did, since trees never survived to that stage), the only involvement of local communities was as labourers while planting saplings.

In all these programmes, the *adivasis* were seen (as a general category with no gender-based or class-based differentials among them) either as passive recipients of government development programmes or as labourers in the projects undertaken by the State. The gender bias of these projects was also clear. Even as passive beneficiaries, it was only the male head of the household, or male village leadership, which was contacted. High-value irrigated agriculture of the sort that the government sought to introduce through land and water resources' development would have, if successful, benefitted primarily men who would have controlled the income from it. It could even have marginalised women unless special measures had been taken to prevent that eventuality. Similarly, the commercial version of social forestry would have benefitted principally men if it had succeeded, since it aimed at generating cash income and not the firewood or local forest produce that women are involved in collecting. Since these projects failed, that sort of impact did not occur. However, the decreased sustainability and accelerated ecological degradation caused by these projects worked against women, as is usually the case.

The AKRSP (I) Initiative: An Evaluation

It was against this background that the AKRSP(I) initiated, in 1985, its programme in the region. The thrust area of the programme was identified as land and water resource-based development. In its initial phase, the agency decided to work along the same lines as the government, its objective being the establishment of successful and economically viable projects through the active involvement of villagers. Being an NGO with access to both material and human resources - in terms of professional expertise - AKRSP did a better job than the government in lift irrigation projects and forestry programmes. But the projects were not successes in terms of people's participation or long-term viability.

However, as a result of these experiences, team members took the programme into a new phase. People's participation became important: locally, village development associations (VDAs) were set up to decide on the specific activities to be undertaken. Also, while formerly concern had been limited to the internal sustainability of the projects and programme, there was now a concern with sustainability in terms of the carrying capacity of the region.

As the programme developed, there was increasing sensitivity to the specificity of the hill farming and subsistence systems. In the area of soil and water resources, the new concern with sustainable development led to the identification of watershed development as one of the thrust areas. At the micro-level, watershed development was on the fields of individual cultivators. This involved activities like contour-bunding, contour-ploughing and farming, and vegetation-bunding. On these micro-projects, most of the work was done by family labour, for which nominal payment was made and the agency was primarily responsible for providing technical support. In this area, the agency showed, at least, some willingness to learn from the local-knowledge base. Local agricultural techniques, practices, and crop varieties were studied and additional varieties introduced that not only helped soil and water conservation, but which also improved production.

The impact of the project did not show immediately. In 1987, the rains were inadequate, but the crops did not fail in the areas were AKRSP(I) had started watershed development programmes. It was found that in those areas soil depth had increased near the bunds. In 1988, with good rains, the yield was around 25 per cent more than before the project.

Another area in which AKRSP(I) was very active was social forestry. The project involved several activities.

(a) Social fencing (protection) of some reserved forest areas where regeneration was possible if indiscriminate grazing and fuelwood gathering were not practised.

(b) Social forestry in the remaining absolutely degraded forest land, planting locally suitable species.

(c) Soil and water conservation in the areas where social forestry was to be undertaken gradionase formation, gully-plugging etc.

VDA representatives, along with agency personnel, would survey the forest tracts, identify areas for protection and plantation, or identify the areas where gully-plugging would have to be carried out. The VDA was also responsible for identifying species to be planted or monitoring mechanisms to ensure that all abided by the rules to not overgraze, lop branches/clear the bushes for fuelwood, or other similar restrictions. Saplings were raised by poor village women, for which the VDA paid from its funds. Later, pitdigging, soil-working, and other works were carried out by the villagers.

By 1991, some signs were encouraging. In many areas, the degraded reserves protected by social fencing showed signs of thick growth. Even the social forestry project--usually a failure in terms of village participation--was a moderate success, with the survival rate of saplings varying from fifty to seventy per cent.

There was some general improvement as far as prosperity in the project villages went. As a result, while some people still migrated outside for labour, they spent shorter periods outside the village. This is thus a success story at many levels. If the agency was in the driving seat, there was still some consultation with the VDA, and measurable results were obtained.

But is it really a success story ? If absolute poverty was reduced, and if mainstream SD models were successfully introduced (though only on a micro level), this was partially because the project did not seriously challenge existing relations, either of class or of gender. Amongst the questions of class involved are those posed by the fact that many of these villages had landless labourers: a few in most, but a significant proportion in some. While they received some temporary employment in various projects, their position was not structurally improved.

More directly relevant to our concerns right now are the questions of gender and sustainability. Are the projects really sustainable ? As far as the self-sustainability of the projects or programme goes it is too early to say. While the individual farmer-based watershed development project is both viable for participants and environmentally sound,

local enthusiasm for it is still limited. If new persons take to it, it is still at the initiative of AKRSP(I). As far as the forestry project is concerned, there are more serious doubts. On the one hand, social forestry projects are still to begin yielding fuelwood, fodder, and other produce to meet village needs. On the other hand, social fencing of the degraded reserves has resulted in the cordonning off of reserves that were formerly used. This cordonning off is, needless to say, beneficial in the long run for the sustainability of the local environment. In the short run, however, it creates enormous pressures. Ironically, one of the factors that has helped the social forestry and social fencing projects is the existence of other patches of degraded reserves nearby where AKRSP(I) does not run its forestry programmes. Villagers have drawn on the resources of these patches to meet their needs at a time when the degraded reserves around their own village are closed to them. In such a complex situation, the role of the AKRSP(I) locally, in keeping the social forestry and fencing programmes going, is enormous: the sustainability of the project without the AKRSP(I) is doubtful.

What about the implications for women of this form of mainstream SD ? The AKRSP(I) was, at least from 1986, aware that women needed to be involved. Attempts were made to institutionalise this concern. From every household--defined as the unit sharing a cooking hearth--one man and one woman, usually husband and wife, were members of the VDA. Each such couple also held a joint account into which payments were made whenever they worked as labourers in any project. Similarly, the agency played a major role in persuading the male-dominated VDA to plant fodder and fuelwood species too in the social forestry projects, instead of hard timber and fruit trees alone.

Yet, the concern for women has not been institutionalised. What are the reasons for this? It would be easy, but also misleading, to attribute it to village-level indifference (which did exist--women attended meetings of the VDA principally because of the insistence of the agency). Equally important were the limitations of the team. For most members of the agency too, the fact of women's presence, and the fact that they worked on projects, was evidence of women's participation. They were sometimes quite blind to women's primary participation in general agricultural work, instead perceiving women as helpers to the male head of the household. Thus, a recognition of women's important role was fitted into comparatively conservative cultural understandings.

As a corollary of this, there was no concerted effort to talk to women alone and identify their concerns. Nor was any attempt made to change the existing relations of power between men and women within the community. For example, women were paid equal wages- a significant departure from local practice. However, the fact that this was not made an ideological issue meant that it was locally perceived as the act of an eccentric benefactor; it was not copied or seriously discussed in the villages. Similarly, the agency made no effort to question the sexual division of labour, or to work against it. In fact, it tacitly used the sexual division of labour to implement the projects more effectively: both men and women did tasks that are conventionally assigned to them in the patriarchal system of the region.

Would it have been possible to pay attention to all these questions and yet implement a mainstream SD project with the same degree of success ? The success and easy implementation was in some senses possible because the project was basically built on the

assumptions of a patriarchal ideology. Thus, it took for granted the right of the male to own and hold agricultural land, to initiate changes in the agricultural sphere, and to make major decisions in the public sphere.

Despite addressing largely men, there were often problems. The VDA was often not convinced of the merit of some SDP practices, as for example the cumbersome procedure of contour-ploughing. Intensive discussions with VDA members convinced some of them, who then put pressure on others in the villages. Changes such as these were possible because the agency addressed itself to the powerful group: the better-off males who could influence others. If the agency had addressed itself only to women, the task would in some senses have been even more difficult. As a comparatively powerless group, women would have found it difficult to initiate or push through these changes, especially since these were not in the spheres considered legitimately theirs in patriarchal ideology.

Conclusion: Women and SD

In saying all this, I do not wish to say that women have no role in mainstream SD. On the contrary, they may have. But we need to formulate more precisely the relationship between women's interests and mainstream SD. The effort to understand this can begin by recalling the distinction made by Molyneux (1985) between the practical and strategic gender interests of women. As Molyneux put it, practical gender interests

> "*are formulated on the basis of women's experience and needs, and arise within the conditions of subordination in the home or workplace. They do not usually challenge the prevailing forms of gender subordination. Women who engage in collective action, on issues of public welfare and consumption, e.g., on food supply, are acting to further such interests. Strategic interests by contrast are defined in relation to women's gender subordination itself. Action to promote these involves challenging the structures of subordination themselves, by amongst other things trying to alter the sexual division of labour, alleviating the burden of domestic labour and childcare, removing institutionalised forms of discrimination, and establishing political equality.*"

Mainstream SD is often likely to check ecological degradation in an absolute sense, even if it does not provide specifically or adequately for the poor, or for women. Since women are the most likely to be affected by an absolute deterioration of the environment, mainstream SD in this sense is sometimes likely to help the practical interests of women. But there is nothing automatic about even the practical needs of women being addressed through mainstream SD.

As for the strategic interests of women, there is little doubt that mainstream SD projects systematically neglect these needs. In this, there is no difference between them and conventional development projects. Indeed, it could even occasionally be the case that they are more actively against the strategic needs of women than conventional development projects. Conventional development projects are usually gender blind. In contrast, sustainable development projects try to use the specific skills of women. In the process, existing gender stereotypes are sometimes even strengthened.

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POVERTY IN INDIA: MICRO-LEVEL EVIDENCE

Barbara Harriss

Introduction

India is a large neighbour to China, its population numbering some 800 million people. While it is the 7th largest industrial power in the world, it also has over half the world's poor. These are estimated at between 250-300 million. The problem of poverty in India is one of the most serious economic problems of the latter part of the 20th century.

While poverty in China is regional and confined to mountain areas, in India it is both regional and structural. There is a high incidence of poverty belt running across northern India and another of high intensity of poverty running down the eastern side. Where these belts intersect, in the States of Orissa, Madhya Pradesh, West Bengal, and Bihar, there is a poverty triangle in which problems become ever more special as time goes on and where the poor are not helped by India's current anti-poverty approaches and policies. Throughout India, poverty is caused structurally by gross inequalities in the ownership of assets in an economic system characterised by private property and markets. The case of India is relevant to China as a warning (because India's is a commodity economy) and its experience may be learned from and compared to that of China.

Here, evidence on a micro-scale will be examined and we should explain what is understood by the word 'micro'. Micro-research is:

- small scale, carried out in a village or a slum; its social detail is fine-grained - individuals, children are studied; and
- the research method used is close observation and much of this research is interdisciplinary.

Poverty is a condition having three main aspects: lack of material goods, lack of welfare, and lack of power. The last aspect is one volunteered by poor people themselves while the first two are aspects defined by observers. Poverty is a market relationship. Though the poverty caused by aspects of market relationships is extremely relevant to this conference, I shall not be considering it much in this paper. The state of poverty can be measured by a series of variables. Material poverty can be measured by assets, income, and expenditure. Welfare poverty can be measured by mortality, morbidity, and malnutrition. Lack of power is studied through vulnerability, autonomy, and entitlement.

In this short paper, I present the general conclusions from a review of over 800 of the thousands of studies on Indian poverty. I look at the data and the sometimes surprising results. These may be useful as hypotheses for studies in China and also as guides to the major focusses of policy for poverty alleviation under the conditions of a developing market economy.

I have been researching aspects of the Indian economy since 1969 but being foreign does not make it easier to write critically about India, quite the reverse.

Assets

Assets are the longest run indicator of material poverty. In a market economy, the poor are assetless or have very few assets: 30-40 per cent of India's rural population have no land. When non-land assets (animals, trees, etc) are added to land-based assets, then we see that the relative deprivation of the landless is intensified. But the poor have an expanded conception of assets which incudes 'human capital'. This concept refers to people, to the composition of the household, in particular to the number and sex of children. The poor also include as assets their houses and their jewellery. The poor have been found to have rational approaches to assets' accumulation. They are not unable to accumulate productive assets, e.g., land or education, rather they are rationally disinclined to invest in such things, either because they are investments which are very specific and hard to divide or because of their uncertainty about the size and security of future returns from these assets. When the poor do invest, e.g., in marriages, they may do so at the expense of current consumption.

The assets of the poor may be dramatically mobile over time. Time trends in assets' mobility are hard to interpret, especially in relation to theories (Leninist theory predicts differentiation and increased pauperisation; Chayonvian life-cycle theory predicts that household size and land size will be related; modernisation theory predicts that small farmers will accumulate). Within a given region, we can observe dispossession coexisting with the persistence of tiny holdings. We can see some poor gaining and other poor losing land. The trends among the poor can be very complex.

Lastly, as in Britain (where women account for 50 per cent of the population yet own one per cent of the assets) so in India but with much worse consequences than in Britain! Women are asset-poor. They are frequently excluded from decision-making about these assets too. Being female, however, is a 'career' and while a young bride or an old widowed mother of a daughter may face discrimination, a mother of sons with her husband alive may wield very considerable domestic power.

Income

It is difficult to collect data on income, because it is declared with caution. The poor tend to overestimate out of pride, while the rich underdeclare to avoid taxes. Among the poor, income may be unknown. This is because it comes from many varying sources. It fluctuates at various periods. It is given in kind (and in forms with no market value) rather than in cash. It is brought in by various household members who have different degrees of control over its uses. Income achieves some meaning when compared with a poverty line.

The Indian Poverty Line (PL) is based on the income needed to acquire a calorie standard of 2,400 cals per person. It is an income and nutritional poverty line, yet it is usually deflated and in it non-food items receive a significant weighting. Such a poverty line

seems very neat and accurate but is in fact quite blurred. It underestimates the cost of social maintenance of a household. At the same time, it overestimates the extent of hunger, firstly because the standard - 2,400 cals per person - is high in relation to average actual consumption and second because grain types and grain prices vary regionally. For example, using wheat and rice and average national prices, 80 per cent of the population of a central Indian village were found to be below the PL but by using local foods - millets - and local average prices, - only 20 per cent of peoples' incomes were under the PL.

Recent evidence has examined the relationships between (i) the incidence and intensity of poverty as discussed above and (ii) the intensity and the instability of poverty. Surprisingly these have been found to be related. The poorest may be most transiently poor while the chronic poor, who are not the poorest, are certainly growing in proportion over time.

Expenditure

Data for expenditure are much more reliable. The poor spend little and remember what they spend. Data on food expenditure are the most statistically reliable because they are less affected by erratic 'lumpy' items.

It has been suggested that the very poorest break the normal laws of food behaviour. They behave 'perversely'. The laws state that, as the proportion of income spent on food declines, the proportion of food expenditure on calories declines and the cost of calories rises. It is argued that the poorest in India are so poor that when their income rises they do not change their expenditure behaviour accordingly and continue to purchase food and cheap calories.

Village level evidence has shown that such perverse behaviour can be found but not among the poorest. For such people non-food current consumption may have to take precedence over food consumption. Some indeed consume elite forms of calories such as wheat or rice in millet regions. This is thought to be because of the demonstration effect of the State distribution system of foodgrains which does not procure millets. Or it is due to having been paid wages by large farmers in the form of such foods instead of cash or millet.

Other expenditure is interesting. We should note that the health expenditure of the poor may not indicate much about their health status. They may seek medical help only when roads are accessible and therefore not in the rains when diseases are at their most prevalent. They may only seek medical help when there are multiple reasons for travelling to town, because few villages have primary health centres in operation. Expenditure on alcohol is undertaken by 30 per cent of rural men. It has been shown that expenditure on alcohol by the male household head is closely related to the extent of calorie deprivation of the rest of the household.

Among the poor, expenditure often exceeds income leading to relations of debt. Yet debt, as a proportion of assets or income, does not identify the poor. The rich are also indebted. It is the uses to which debt is put that identify the poor. Debt is contracted for

consumption rather than production and on distinctive terms and conditions - either at zero interest from friends and kin or at high interest in private money markets, sometimes also interlinked with contractual obligations in other markets (e.g., labour markets). The poor are distinctively excluded from access to most State credit schemes.

Mortality

Turning to welfare, and to what people can be or can do, mortality is the extreme indicator of lack of well-being. Mortality data have two inconvenient characteristics. First, they are usually collected in isolation from economic or social data. Second, there is a trade - off between the large number of cases necessary to build reliable demographic indicators and the small number of closely observed case studies necessary to explain the social reasons behind patterns of mortality. Mortality is vulnerable to measurement error because of people forgetting children who have died long ago, especially female children.

It is supposed that there are close relationships between mortality, morbidity, and malnutrition, on the one hand, and between mortality as a proxy for the other welfare indicators and poverty on the other.

Micro-level evidence broadly confirms the second supposition. In many villages, the mortality pattern of outcaste, landless labourers is 50-70 years behind that of the upper caste landowners. At the same time the simple relationship between poverty and mortality is questioned, especially in the light of evidence about sex bias. As regards mortality, women in India, especially in northern India, are the poorer sex.

There are clearly contradictory relationships to be observed in India between income poverty and increasing or decreasing anti-female biases in mortality. Where anti-female bias is maximised among the poor, it is thought that poverty makes a given degree of sex bias in allocations of income or health care within the household more fatal; and also that it is in such households that the relative cost of health is greatest. Where the reverse is observed - where there is least anti-female sex bias in the poorest households, it is supposed that poverty undermines the patriarchal basis of discrimination and that women have a higher relative social status vis-a-vis men whatever their economic status.

Some highly-specific explanations are necessary in order to explain mortality patterns, especially among children. Here it seems that birth order and sibling sequence is important. In cultures where sons are desired, the first daughter may be cherished, but the second daughter has a 70 per cent greater risk of mortality before the age of five, while the third daughter has a 90 per cent greater risk. Similarly, the birth interval is important. Where children are closely spaced, the younger has a raised probability of mortality, other things being equal.

Morbidity

Information about sickness is of two types. Either it is detailed and diagnosed by a medical doctor or it is 'point prevalent' and consists of the number of days in a given period when the respondent was sick. Many measurement errors are involved in the last sort of data which are the commonest sort. Illness is a gendered concept: for men being

individualistic and related to the environment and for women being a family concept and related to the transgression of ritual observance. Then there are four different systems of health, illness, and therapy in India and there is most likely to be most divergence between the system of the poor and that of the investigator.

Micro-level evidence suggests that the poorest do not always have the lowest health status. This is because of the countervailing affects of a number of factors.

(a) The disease environment. Infectious diseases (upper respiratory tract disease, the dysenteries and diarrhoeal diseases) are highly seasonal and may affect all people or all of a given age group.

(b) The strategy of social reproduction from one generation to another which may result in the benign neglect or the deliberate culling of female children, also the neglect of elderly widows.

(c) Therapeutic behaviour which causes harm. Male babies may be earlier weaned than female babies. As a result they may be deprived of Vitamin A and may be more vulnerable to diarrhoeal disease because of the poor hygienic conditions in which feeding bottles are kept. Eye disease, which is closely associated with mortality irrespective of poverty, may be exacerbated by the application of steroidal eye creams. Cultural 'superfood' such as (unhygienically prepared) ice cream may be fed to boys and not to girls.

The relationship between poverty and morbidity is characterised by feedbacks. Sickness reduces appetite at the same time as it increases need, lack of food increases susceptibility to disease. The costs of sickness are direct: the cost of access to the therapist, the cost of medicines for treatment, and the cost of nursing. They are also indirect: the loss of income foregone through illness and caring and sometimes the loss of future income as happens when young girls are removed from education to perform caring work and thereafter permanently deprived of education.

Malnutrition

Malnutrition is measured in two different ways: by anthropometry (that is measurements of height, weight, and age) and by nutrient (mainly energy) consumption. Taking anthropometry first, there are problems in the standards that are used for evaluation. American standards may not be locally appropriate, yet local ones may be already affected by gender bias. Next there is no very convincing evidence for any state of malnutrition, except that of "very severe", being connected in any predictable way with future disadvantages, e.g., in cognitive ability, in life expectation or fertility, in earnings or productivity. Lastly anthropometric status is the result of the interaction between disease, care, and food supply, and we would be wise not to make inferences about any specific cause of low status in the absence of supportive information on these three factors.

Recent evidence suggests that anthropometric status has a low variation with income. The factors distinguishing the families of severely malnourished children in two micro-studies related to the labour process: in one case to chronic paternal illness where women

were not allowed to carry out wage work; in another case to the total work load of mothers (wage work, unwaged 'domestic' work). The positive impact of a woman's income was more than offset by the negative impact of her work on time for child care. As regards gender bias in anthropometric status, the evidence is inconclusive. It may not be marked, or it may be contradictory (as in a famous case concerning Bangladesh where acute anti-female gender bias and absence of gender bias have been found close by) gender bias as found in ICRISAT's village studies in central India.

Nutrient intake is acutely hard to measure. While anthropologists concentrate on unusual food behaviour, such as fasts and festivals, the nutritionist needs to watch food intake over a period of three to seven days, in unexceptional circumstances, and to repeat this practice seasonally. There is a trade- off between precision, high costs, and the invasiveness of the technique. Errors of omission (breast milk, snacks outside the house) and commission (faulty duplication of the portions served for subsequent laboratory analysis) are common. Nutrients gain meaning when compared with need. Need is the most controversial concept in nutritional science. Energy is needed for growth, activity, and maintenance and only the latter can be estimated with any precision. Besides, it is now thought that the body can adapt the efficiency with which it metabolises energy in inverse relation to energy intakes, a process which stymies the idea of a fixed requirement for anyone.

Recent evidence shows low variation of energy intakes with income (in the region of only seven to 25 per cent over the income distributions of a series of villages). There is a high degree of regional variation, southern Indians living on average on 400 fewer calories per day irrespective of income. And nutrient intake is not very sensitive as an indicator of other aspects of female disadvantage.

Vulnerability

This is a loose concept referring to people's capacity to withstand shock. It is a probabilistic concept. It is also a relationship rather than a state. Much recent research has explored the vulnerability of the poor.

This work has resulted in typologies of shocks (e.g., unavoidable ritual obligations; mental or physical incapacity; natural disaster; and shocks in the market relations in which poor people are embedded). Two types of response have been distinguished: coping responses through which the poor attempt to retain their social status and survival responses through which the poor attempt to stay alive, irrespective of social status. These responses have been shown to be diverse, sequential, and specific to precise localities.

An influential model of seasonal coping, in semi-arid agricultural regions with one cultivation season in the rains, has generated the idea of seasonality being a poverty ratchet. The rainy season is one of low food stocks and low consumption, high food species, high energy expenditure, high incidence of infectious disease, and (for adult women) lactation. The applicability of this model depends on the non-existence of the non-farm economy.

The impact of such coping strategies depends, it is thought, upon the types of initial shock; the predictability of the shock; and its intensity, duration, and co-variation with other shocks.

Autonomy

Autonomy refers to the capacity to decide and act for oneself. It is not only material poverty (forcing people into market or outright coercive relations which deprive them of choice) but also aspects of culture (in the India case most notably patriarchy and caste untouchability) which threaten autonomy.

Data on autonomy are 'soft', qualitative, and often ambiguous. We have discovered that the factors thought to affect people's autonomy do not act without contradiction (e.g. (i) the distance of a young married woman from her natal home does not always affect her contact with and support from them; (ii) the practice of secluding women (done by both Hindus and Muslims in north India) does not always prevent a woman from working or moving outside the home. Similarly, given aspects of autonomy do not have unambiguous welfare outcomes (e.g., the change of family type from extended to nuclear does not always benefit women. While it may increase her decision-making power, it may also increase her work load and reduce support for her if her husband makes decisions over resources with which she would disagree).

Entitlement

This refers to the capacity of people to claim their customary or legal rights. There are three types relevant to the poor. First, there is customary entitlement. These define inclusion or exclusion in a local community and people's rights of access to collective social security mechanisms and collective acts of redistribution, also to common property resources (such as forests, wasteland, stream beds, threshing floors, ponds, etc). Micro-level evidence shows that these entitlements are disproportionately important for the poor. It also shows that in India these rights are being progressively eroded. Degradation, privatisation, and commercialisation are disentitling the poor.

Second, there is promotive entitlement. These are legal or constitutional rights that are promotive - encouraging - but not prosecutable in law. Such rights cover health, education, and food in India. Village level studies reveal consistently that, whereas the poor are not barred from such entitlements, they are very imperfectly entitled. The conditions of liberalisation and budget cuts enforced on the Indian Government by the International Financial Institutions are predicted to further threaten such entitlements.

Third, there is legally enforceable entitlement. Examples include land tenure law which guarantees security to tenants, rental ceilings, and wage floors. Village level evidence shows that, with few exceptions, the poor are embedded in illegal market relations to the advantage of landlords and employers. The poor are also thoroughly debarred from access to the means of enforcement - the legal system. And were they to get legal redress, the poor have no means of enforcing implementation.

Conclusion

Welfare and material indicators do not identify the same sets of people because of the countervailing effects of the age, gender, and class division of labour; because of differentials in status of individuals within households; and because of food and health behaviour and its logic.

Other factors make the nature of poverty very complex.

(a) The climatic and agroecological environment about which much is being discussed at this conference .. Suffice it to say here that many of the remarks about mountain areas apply equally well to lowland areas under conditions of unequal assets and income distribution.

(b) The disease environment.

(c) Deformities of the markets in which the poor are embedded. Commonly- observed distortions of markets in India include the following.

- Local monopolies, price fixing cartels.
- Interlocked contracts in which the terms and conditions of a contract on one market affect participation and transactions on another or more markets. Trade contracts involving three markets (labour, money, and grain) and three agents (trader-moneylender, borrower-water seller, and borrower-water purchaser) have been observed.
- Compulsive commercialisation where pre-harvest debt forced post- harvest sales at low prices and pre-harvest purchases at high prices.
- Unsymmetrical payment systems in which a purchaser pays immediately but is paid for his sale in turn in a way which is lagged over time and not compensated for by interest or a price rise.
- Criminal practice: fraud in weights and measures, arbitrary deductions, adulterations, etc.

(d) Access to social security institutions (ranging from those operating at the community level to social insurance and social assistance provided by the State (which is yet very defective and extends mainly to employees in the government and private corporate sector).

(e) Remoteness from State-sanctioned entitlements.

Despite the fact that those living under the poverty line in India fell from 60 per cent in 1970 to about 35 per cent in 1991, the problem of poverty is still very pressing.

The poor themselves call for an end to coercive market relationships and for State interventions, enabling them to receive food, clothing, health, pensions, and accident benefits and greater State accountability. Unless and until society becomes more accountable (and it could well start with closing tax loopholes wherein 70 per cent of all income taxes are evaded) it is of little use calling for major policy changes.

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CHILDREN, ENVIRONMENT, AND SUSTAINABLE MOUNTAIN DEVELOPMENT: A UNICEF PERSPECTIVE

Deepak Bajracharya

Environmental Degradation in the Mountains and the Impact on Children and Women

More than 500 million people, one-tenth of the world's population, live in the fragile mountains -- most of them, the poorest on earth and neglected victims of environmental degradation whose livelihood has been threatened in the most serious way. The worst manifestation of this sad state of affairs is evident in the very high rates of mortality among infants, children, and mothers. For example, in two very mountainous countries -- Nepal and Ethiopia -- infant mortality is amongst the highest in the world; 123 and 130 respectively for every 1,000 live births. Among children under five years of age, the situation is just as severe (189 and 220 per 1,000 live births respectively). Mothers too are very vulnerable, as evident in the extremely high maternal mortality rates (830 per 100,000 live births in Nepal, for example). Malnutrition is another serious problem, as indicated by the large percentage of children under five whose weight for their age is lower than normal. As many as 70 per cent of these children in Nepal and 38 per cent in Ethiopia are victimised this way. Access to safe water and adequate sanitation is furthermore limited to only a small number of people (national average of 19 per cent each in Ethiopia; in the rural areas, the figures are even lower, 11 and 7 per cent respectively). Literacy among adults and school enrollment among children are similarly extremely low (UNICEF 1992a). The deprivation of these basic necessities amongst such a large part of humanity is disturbing indeed.

I do not need to explain to this audience the very direct dependence of the people in the mountains on the state of the environment for the maintenance of their livelihood. Clearly, from the point of view of the millions of these poorest people on earth, the principal environmental concerns consist of the ever-present threat of disease in the immediate surrounding; the decline in household food security, often related to inadequacies of agricultural practices and loss of fertility in their fields; and the lack of clean water and safe sanitation. Accelerating soil erosion and landslides, as well as rapid loss of habitat and genetic diversity, have become ever more threatening to the sustenance of their livelihood. Alternative opportunities for a better livelihood must be found urgently and, in the search for sustainable solutions, the importance of people's participation and empowerment cannot be overemphasised.

Agenda 21 and the Human Dimensions of Poverty and Environment

Conceptually there is now a wide acceptance of the need to address such human dimensions of environmental degradation in relation to the state of poverty. This is evident in the discussions held less than a year ago at the Earth Summit -- the United

Nations Conference on Environment and Development -- when world leaders from 178 nations reached a consensus on issues concerning "environment and development" and adopted the Rio Declaration, Agenda 21, and the Principles on Forest Management, Conservation, and Sustainable Development after two years of negotiations. Equally important, this was a major topic of discussion at the Global Forum in Rio de Janeiro when 18,000 people from 10,000 non-governmental organisations from 171 countries -- representing the public at large -- pursued this concern with tremendous energy and commitment.

As a consequence of this dialogue among diverse interest groups and stakeholders around the world, Agenda 21 -- the operational document on environment and sustainable development for the 21st century -- provides a useful framework for comprehensive and far-reaching action and hence for grappling better with the critical challenges that lie ahead. At least three fundamental concepts that have gained acceptance are worth noting in this context.

First, Agenda 21 represents the most significant attempt yet made to unite the concerns regarding environmental degradation and poverty.

Second, Agenda 21 brings a forceful perspective on the need to curb profligate consumption and to concentrate on the principles of equity and justice. This is in recognition of the fact that one-fifth of the world's population in the North consumes 70 per cent of the world's energy, 75 per cent of its metals, 85 per cent of its wood, and 60 per cent of its food. If the same material standards are to be replicated in the South, it would require 10 times the present amount of fossil fuel and 200 times as much mineral wealth. These requirements would double again as the world population doubles in the next 40 years (Pronk and Hague n.d.).

Third, Agenda 21 has rightly recognised that all groups that make up our society have distinctive roles to play in the proper management of the earth through a unified, mutually-reinforcing, multi-sectoral effort. This necessitates a democratic, participatory approach to environment and development and a more prominent role for the vital contributions of NGOs.

The Mountain Agenda

In this context, thanks to the advocacy spearheaded by the United Nations University, the International Centre for Integrated Mountain Development, and International Mountain Society, it is significant that Managing Fragile Ecosystems: Sustainable Mountain Development has found a rightful place in Agenda 21 (Chapter 13).

This chapter carried forward the argument for a human-centred, poverty-focussed approach to environment and development by pointing out that resource management has to be integrally linked with socioeconomic development. To this effect, two programme areas are identified. The first dwells upon the generation as well as upon the strengthening of the knowledge base concerning the interrelationship between ecology and sustainable development in the mountains and upon combining the best of the modern

and the traditional. The second is more action-oriented as it advocates the integration of watershed development and enhancement of people's livelihood by translating knowledge and opportunities into action with the active participation of local people, especially women, so that they will have a say in determining where they are headed. In both programme areas, the main focus is rightly on the human-centred, intersectoral approach to poverty alleviation that recognises the fragility and diversity of the mountain ecosystem as well as the strengths and weaknesses of people living there.

UNICEF Concerns in Agenda 21

The human-centred, poverty-focussed approach to environment and development is in accord with UNICEF's strategies, especially with regard to the long-standing involvement for the survival, development, and protection of children and women. We find it relevant that Agenda 21 recognises infants, children, and women as the vulnerable group needing special protection and education. In relation to children, Agenda 21 notes the following.

> "*Approximately one third of the world's population are children under 15 years old. At least 15 million of these children die annually from such preventable causes as birth trauma, birth asphyxia, acute respiratory infections, malnutrition, communicable diseases, and diarrhoea. The health of children is affected more severely than that of other population groups by malnutrition and adverse environmental factors....*
>
> *Specific major goals for child survival, development, and protection were agreed upon at the World Summit for Children and remain valid also for Agenda 21.*"

In this regard, Agenda 21 contains specific recommendations to be pursued actively by UNICEF in close cooperation with government organisations, NGOs, and international agencies (UNICEF 1992b). This would imply that the environmental perspective which has been implicit in UNICEF's programmes for survival, development, and protection of the world's children will have to be made more explicit. As Maurice Strong said, "*The effort to reduce child illness and malnutrition and to reach the goals of the World Summit for Children is crucial not only for its own sake but also as a means of helping to slow population growth and make possible environmentally sustainable development in the 21st century and beyond* (UNICEF 1993)." For incorporating the environmental perspective more explicitly into ongoing UNICEF programmes, three mutually-reinforcing aspects are to be stressed in accordance with Agenda 21 recommendations. These are based on the premise that, "*our planet must be preserved in order to nurture our children; equally, or children must be better nurtured to preserve our planet* (Grant 1992)" UNICEF's Executive Director has recommended these for discussion at the Executive Board Session next month.

Primary Environmental Care (PEC)

PEC is a community-based development approach that has three inter-linked elements: (a) meeting basic necessities, (b) empowering local people and their communities, and (c)

ensuring the protection and optimal utilisation of natural resources in and around the community. UNICEF finds it promising to focus on PEC within the wide-ranging environmental concerns. In the same way, it has emphasised primary health care (PHC) as opposed to higher level referral services and specialised medical care, or basic primary education as opposed to secondary and tertiary level education. The basic idea is that environmental considerations must be linked to the economic and social progress of those whose livelihood has been threatened by environmental fragility and degradation. Innovative environmental interventions at the community level are necessary to enable people, especially the poor, to manage their resources responsibly and creatively so that they can meet key goals related to health, nutrition, and household food security and have access to low-cost water supply, environmental, sanitation, and basic education. Experience suggests that meeting these social development goals can be particularly beneficial for the protection of the environment.

Building Environmental Awareness among Children and Women

The empowerment of children and women is crucial. Any society that cannot care for its children cannot regard its development as sustainable. The growing minds of children must be infused with the fundamental precepts of: (a) their rights to a "first call" on resources for a decent livelihood as outlined in the Convention on the Rights of the Child and now ratified by more than 130 countries; and (b) their responsibility to future generations to hand over a healthy environment that will enable future children to enjoy the fruits of a better world. From this perspective, they have to be active participants in the development process and in environmental improvement. The appeal made by children at the Earth Summit (in conjunction with the hearings organised by the Voice of the Children International Campaign) has, for example, articulated well their awareness and concern for the environment.

Similarly, in line with the growing recognition that women are the most important resource managers, they must have the opportunity for access to and rights over land and other resources, education, and safe and equal employment, in accordance with the Convention on the Elimination of All Forms of Discrimination against Women and the Nairobi Forward-Looking Strategies.

Advocacy and Social Mobilisation

Poverty and environmental degradation have been so persistent and widespread that action has to be pursued on an urgent basis and on a sufficiently large scale to make a significant difference. Furthermore, strategies must be operational on different fronts, ranging from grass-roots' activism; poverty-focussed technological development; national policies oriented towards decentralised activities; and international public support for addressing the problems of human deprivations in developing countries. What is needed, as advocated in the 1993 Report on the State of the World's Children, is a "Movement for Basic Needs".

Based on the mandate, experience, and operational flexibility of UNICEF for activities concerning children and women, the strategy for advocacy and social mobilisation should be pursued in a number of different ways.

- Providing modest seed funds to government agencies, university and research institutes, NGOs, and community groups to initiate innovative activities for improved livelihoods at the household and community level, especially among the poorest.

- Going to scale, by incorporating such innovative ideas and opportunities, derived from PEC, into country programmes and National Programmes of Action (NPA).

- Social mobilisation to promote PEC at household and community levels, by raising the awareness of problems as well as possible approaches and encouraging self-help initiatives to sustained action in the context of the country's social, economic, and ecological conditions.

- Support to advocacy campaigns to highlight the concerns of children and women, their rights, and considerations of inter-generational equity, by organising children's hearings at national and international forums as conducted by the Voice of the Children International Campaign; raising awareness about the opportunities and constraints of Agenda 21 by organising children to study and rewrite their own version, as initiated by Peace Child International; and conducting women's hearings and tribunals at national, regional, and global levels as organised by WEDO, UNIFEM, and Worldwide Network and WEDO.

- Mobilising inter-agency cooperation for the funding of programmes at national and sub-national levels to strengthen people's capacity to look for solutions to their problems.

Examples of UNICEF Involvement in Mountain Regions

The concept of PEC, although not known explicitly by that name, except in a few recent cases, has been implicit in UNICEF's health, nutrition, education, and water and sanitation programmes. It is often more prominent in area-based development programmes which seek to provide integrated basic services in rural and urban areas. The focus in mountain regions is based on UNICEF's two strategic priorities: "to reach the unreached and difficult to reach" and "disparity reduction" as part of the goals for child survival and development in the 1990s. Three cases are described below to illustrate various types of innovations pursued in mountain regions in response to specific social, cultural, and economic circumstances.

Basic Services' Programme in Disadvantaged Areas of China

This programme complements the national programme for poverty alleviation in poor counties. It focusses specifically on the more disadvantaged counties. The State Council's Leading Group for the Economic Development of Poor Areas (LGEDPA) is responsible for leading a vast poverty alleviation programme covering directly 328 counties and indirectly, through provincial aid, 370 more. Including the 77 counties of Tibet, that have been added recently, the total of poor counties being served in China is 775. According to a World Bank estimate, there are 90 million people who still live below the poverty

line. UNICEF's Basic Services' Programme concentrates on this population by complementing LGEDPA's economic development efforts. The delivery of basic social services is an important component of poverty alleviation work. During the current 1990-1993 cycle, the focus is on 36 poor counties in 11 provinces/regions of China that have the highest concentration of the poor and the minorities. Most of them are located in remote and mountainous regions that are difficult to reach. These 11 provinces/regions are: Jiangxi, Henan, Sichuan, Shaanxi, Gansu, Xinjiang, Qinghai, Tibet, Guizhou, Yunnan, and Anhui.

The main objective of the 11 projects is to identify, design, and implement such activities as strengthening maternal and child health; empowering poor families, especially poor women, with the essential self-help, knowledge, and skills for enhancing their economic power; improving primary education, by focussing particularly on the girl child; and increasing safe drinking water coverage and proper disposal of human waste. The intention is eventually to identify a "working model" and develop strategies for replicating the process in other disadvantaged areas.

The Basic Services' Projects were initiated in Sichuan, Henan, Jiangxi, and Guizhou in early 1990 at the beginning of the current programme cycle (1990-1993). The four provinces have now gained proficiency in project management skills. Preliminary reviews of the projects indicate that all four provinces achieved more than was specified in the Project Plans of Action. Government inputs for the four provinces have been most encouraging. Specifically, good intersectoral cooperation at the county level was evident in Jiangxi; leadership and care from county governors was strong in Sichuan; and convergence was achieved in Henan. For the projects started only in 1992 (Qinghai, Shaanxi, Xinjiang, Gansu, Tibet, Yunnan, and Anhui), there is room for improvement in the delivery of basic social services to the most vulnerable groups.

Community Development through Handmade Paper Production in Nepal

Paper made out of the bark of *lokta* bushes (*Daphne bholua* and *D. papyracea*) was prized for its strength and durability. The 800-year technology was, however, rapidly becoming abandoned. In 1981, UNICEF and the Small Farmers' Development Programme (SFDP) of the Agricultural Development Bank of Nepal (ADB/N) initiated a project that helped revive and revitalise the technology while providing opportunities for additional income to *lokta* cutters, paper-makers, and block printers. It was particularly appropriate because the operation involved the employment of men and women during the slack season when agricultural labour demand is minimal.

The project started with UNICEF's commitment to provide technical support and a financial grant of about $280,000 over a three-year period. The SFDP's role was to mobilise and organise rural *lokta* cutters and paper-makers in the remote villages of three districts in Western Nepal through training in group forming, marketing, and accounting. It also made available several critical inputs, not found locally. In addition, the SFDP was entrusted by the Department of Forests with a *lokta* harvesting license in specific forest areas and was authorised to distribute permits to interested residents. The locally-made paper was subsequently transported to Bhaktapur Craft Printers (BCP) in Kathmandu Valley where it was used for printing greeting cards. Subsequently, these

were sold by outlets of UNICEF's Greeting Cards Operation (65 %) and a variety of other buyers (35 %).

The number of families engaged in *lokta* harvesting and paper-making increased steadily from 282 in 1982 to 938 in 1991. Indirect employment, due to porterage, accrued to an additional 250 families. Local income increased correspondingly by three times by 1991, compared to the initial amount of $57,000 in 1982. At the BCP, the number of employees grew from 26 in 1981 to 154 in 1991. BCP's gross income from sales increased from $87,000 to $350,000 during the period and the net income from $900 to $120,000. BCP has, in the mean time, become self-supporting since 1985. Plans are underway to make it a private company with a 50 per cent share to be held by ADB/N, five per cent by BCP staff, and 45 per cent by participating communities.

The community development fund (CDF) was a built-in component of the undertaking. Three thousand families have consequently benefitted from the installation of potable water supply and public latrines, school improvements, health centres, veterinary services, flood control and soil conservation works, and a micro-hydroelectric installation. A seed grant of $60,000 was contributed by UNICEF for the first three years. From 1984 onwards, 50 per cent of BCP's net income was used to replenish it. All projects, identified by the participating families, were implemented with at least 40 per cent contribution by the community. In 1991, annual expenditure on these activities was close to $150,000 (65 per cent from the community).

Other innovations were notable during the development process.

- In 1983, the haphazard harvesting of *lokta* was threatening its sustainability. A comprehensive management practice was thus introduced with the help of the Department of Forests. Also, *lokta* harvesters were trained in using the measuring instrument so that *lokta* bushes of at least 6-7cm in diameter would be cut 15 cm above the ground in order to facilitate proper coppicing. As a consequence, *lokta* harvesting is now sustainable.

- Fuelwood consumption was reduced by 75 per cent when caustic soda was used, instead of ash, to break the *lokta* fibres during the boiling process. A further 35 per cent reduction was made possible by the introduction of improved stoves. The ADB/N and BCP have helped to make caustic soda readily available and also in the distribution of 150 improved stoves so far at 50 per cent subsidy rates. In addition, local residents have established two nurseries and replanted several fuelwood species in an area of about 70 ha.

For the future, BCP has managed to mobilise the Department of Cottage and Village Industries, the Ministry of Forests, the Forest Research Division, ADB/N, and NGOs to look into more efficient energy-saving methods (including solar cookers) and alternative raw materials for paper making. During the next five years, the outreach will be extended to 11 districts. By using alternative raw materials -- *sawai* grass, banana leaves, *banmara* (literally,forest killer weed, *Eupatorium* spp) -- the expansion of operations will increase BCP contribution towards CDF to $500,000. If everything goes as planned, the subsequent move is to go nationwide.

Based on a 1987 directive from the Ministry of Education, a primary school programme was introduced in Fenerive in the Toamasina province of Madagascar. UNICEF supported the preparation of school textbooks for three successive grades by incorporating the relevant concepts of nutrition, hygiene, and environmental protection, and they were integrated into classroom teaching. Also the UNICEF contribution facilitated the training of teachers and interested parents in school gardening and agroforestry techniques. Twice a week, throughout the school year, children participated in school gardening and fruit tree planting. Parents helped to prepare the land for planting and also to fence the garden area for protection against wandering livestock. Some participated in growing vegetables on demonstration plots along with those grown by the children. The produce from the vegetable gardens was used occasionally for school meals and was also sold at times for the purchase of school supplies.

In 1989 an area-based programme was introduced to involve teachers and interested parents in family gardening and agroforestry, as well as in the construction of improved stoves, tree nurseries, and latrines. Low-cost community child-care centres and vocational training for youth were also part of the programme. Local NGOs and relevant government ministries (including education, agriculture, water and forestry, animal production and fishery, and population and social affairs) participated in the implementation.

Within two years of implementation, a number of encouraging results were observed.

- Creating of Peasants' Associations in five out of 11 sub-districts.
- Training of Association Members in establishing village or household nurseries.
- Introduction of new varieties of vegetable seeds as well as fruit and coconut seedlings and marketing of the produce.
- Reforestation and soil protection measures on selected sites.
- Popularisation and promotion of improved stoves and ovens.

A detailed study is now being carried out to assess the impact of the project on the livelihood of the population, with particular focus on the children. Also the study will look at the implications for replicating the success in other parts of Madagascar.

In the meantime, two other developments are particularly noteworthy. The Ministry of Education has already announced that the Fenerive model will be introduced in all the 13,000 schools around the country. A master plan (ENAP) to this effect is currently being prepared.

Another initiative has been taken by the National Office of the Environment (ONE) and the Cellule Mere-Enfant of the Prime Minister's Office in conjunction with the multi-donor effort to implement the Environmental Action Plan (PAE). Based on the realisation that

this plan had not incorporated the perspectives on children and women, the Fenerive model was presented at a donor's meeting in 1991 to illustrate how environmental education and community action could be combined to improve people's livelihood. Encouraged by the enthusiastic response from all donors, UNICEF helped ONE and the Cellule to design a programme of action with the help of a group of international and national consultants. Programme A-Z, Ankizy sy Zavaboahary: Solofo Dimbin'ny ala (PAZ), meaning "children and environment: young shoots who renew the forest," is the outcome of this effort. This will be implemented in the country from 1993 onwards. It is planned that the PAZ will begin by launching the ENAP curriculum in the drought-stricken Southern Province in conjunction with a food relief and rehabilitation programme centred around the primary schools.

Lessons Learned

Several relevant lessons can be derived from UNICEF's experience, with these and other examples in mountain as well as other ecologically vulnerable regions, for implementing PEC more effectively, with highly beneficial impacts on the well-being of children and women in particular. These observations corroborate the experiences of other agencies, such as the International Institute for Environment and Development, Oxfam and Action Aid, which have articulated and adopted the PEC approach. They fit in well with the emerging consensus on the principles and approaches concerning area-based development. The main lessons may be listed as follows.

- Development must provide opportunities to the poor to enhance their livelihood by focussing on food security, health, water supply, sanitation, basic education, and income generation, in accordance with their own priorities.
- Technological and organisational approaches must be oriented to the generation and extension of small-scale, low-cost technologies that are appropriate in the local context and that benefit the poor in particular, by building on indigenous knowledge and awareness of the environment and by devising new solutions when old approaches are no longer effective.
- Local responsibility and action must be promoted to improve the productivity and protection of existing land, water, forest, and other natural resources by ensuring tenurial rights and access to new information and financial resources.
- Government institutions and local functionaries must provide the necessary political support to encourage the process of community-based environmental management to take place.
- Outside planning and implementing agencies (including government organisations, NGOs, university groups, and international agencies) must commit themselves to enter into dialogue with people for long-term human resources, development at the local level by adopting a flexible approach, and accepting a longer time-frame for support.

Conclusion: A Need to Bridge Political Will, Knowledge, and Action

In pursuit of the decisions made at the Earth Summit, UNICEF's Executive Director has recommended, as explained above, that the Executive Board approve, at its next session in April 1993, the incorporation of PEC as an approach to meet the basic needs of children and women on a sustainable basis (i.e., to improve the status of health and nutrition as well as the access to education, safe water, and adequate sanitation as elements of a decent livelihood). Integral to this approach is the active participation and empowerment of children and women in the process of protection and optimal utilisation of natural resources. While implementing PEC, the recommendation suggests that priority be given to the poorest who are hardest to reach and are living in the most environmentally degraded and vulnerable conditions. References were made particularly to the 500 million people in the mountains who live in jeopardy from soil erosion, deforestation, and other forms of environmental degradation.

Clearly, there are a lot of knowledge- and action-oriented activities taking place in different pockets of the mountains. Politically, the climate is right for forging new partnerships to address the issues of environmental degradation and poverty, especially in the most vulnerable regions such as the mountains. The key questions that can be asked in this context are as follows.

- How can effective consolidation of efforts take place in order to make a significant impact on improving people's livelihood in the mountains, as measured in terms of, for example, better health and nutrition among children and women, or greater access to safe water supply and sanitation facilities, or improved mechanisms for fuel and fodder supply, etc?

- Given the favourable political attitude, nationally and internationally, towards fostering people's participation and empowerment, what are the institutional mechanisms that would encourage innovations at the local level to fight against environmental degradation and sustain improved livelihoods?

- Children represent the new generation and the bridge to the future. What are the moral and ethical principles they could imbibe that would help them meet the needs of the present without mortgaging the future? What can be done to stop the erosion of traditional survival skills and adaptive strengths and transmit them instead to children? Can innovative approaches to environmental education be introduced to enhance their life skills and ensure environmental soundness and sustainability?

These are a few questions that I hope the Forum will address in the course of this week.

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ACCESS AND SUSTAINABILITY: GROUP-BASED SOCIAL AND FINANCIAL INTERMEDIATION IN THE NEPAL HIMALAYAS

Lynn Bennett

The Limits of Credit as a Strategy for Poverty Alleviation

Before I speak about group-based financial service programmes as an approach to poverty alleviation, it is important to stress the limitations of the approach -- because it has been greatly oversold by many governments and donor agencies as a "magic cure" for poverty.[1] Credit programmes are not a substitute for

- investments in better education, health care, and social services for the poor;
- investments in infrastructure -- especially in isolated mountain areas -- to allow the economy to grow and create opportunities for self employment and wage work; and
- safety nets for the vulnerable to make sure they have adequate food, shelter, and basic services.

In fact, it is important to emphasise that supply-led credit programmes are not a good way to help the "absolute poor". Such programmes can actually harm the very poor by encouraging them to adopt high-risk enterprises that often leave them in debt rather than with higher incomes. The most appropriate type of financial service for this group is safe, accessible savings' facilities.

However, credit may help the very large numbers of "middle poor" who inhabit the mountainous regions in most of Asia. In the past two days we have been exposed to many exciting agricultural technologies that can transform marginal mountain areas into productive ones. But these technologies do require investments -- either from the central or local government or from the individual farm family. Likewise, as markets develop, there are increasing opportunities for rural micro-enterprises that need some capital to get them going and, later, to expand them if they go well. So there is clearly a large role that responsive financial systems can play in moving mountain people out of poverty.

There has been a number of programmes in Asia that have established successful and cost-effective systems for financing efforts by the poor to increase their own productivity. One of the most well known is the Grameen Bank in Bangladesh, but there are many other successful efforts in Asia -- most of them run by non-government organisations

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1 This paper is based on a longer paper prepared for the Nepal/Bangladesh Country Operations Industry and Finance Division of the World Bank's South Asia Region. The paper, entitled "Sustainable Financial Services for the Poor: Building on Local Capacity", is currently under review and was co-authored by J.D. von Piskche, Michael Goldberg, and myself.

(NGOs). Nevertheless, caution is in order, because, even though many of these programmes have succeeded, at least for a time, in reaching the poor, from a banker's point of view most of them have been failures.

Criteria for Successful Credit-based Poverty Alleviation Programmes

Basically, there are two things that a successful poverty-lending programme must achieve.

1. Increased access for poor and marginal groups including:

   - women,
   - landless,
   - resettled peoples,
   - tribal/minority peoples, and
   - mountain peoples.

2. Financial sustainability. Sustainability has two aspects.

   - For clients

     Sustainability requires that programmes have a positive and lasting impact on the target population, giving them the ability to create durable relationships with financial intermediaries. This may be assisted by services that increase clients' income and enable them to repay; it must include incentives to be accountable and to repay.

   - For the financial institution

     Sustainability means earning enough from its services to continue to provide them and to upgrade them without continual support from government or donors.

Evidence from Nepal

We recently completed an intensive field-based study of the two major, credit-based poverty-alleviation programmes in Nepal: (i) the Production Credit for Rural Women Programme (PCRW) run by the two government-owned commercial banks and the Ministry of Local Development and (ii) the Small Farmers' Development Programme (SFDP) run by the Agricultural Development Bank of Nepal (ADB/N). What we found was not encouraging from the point of view of sustainability. The PCRW loses 28 per cent of what it lends each year. Only five per cent of this is the bank's delivery cost; the remaining 23 per cent is loss from bad debts. The situation of SFDP is even worse, with losses amounting to 37 per cent of what is loaned each year.

Obviously, continuing losses of the magnitudes endured by the two large State-owned commercial banks and the ADB/N have serious implications and unfortunate consequences. They are undermining the viability of the banks and, since all three

implementing banks are government owned, these programmes are draining the government treasury which has to cover bank losses. But the subsidies involved in accepting continuing default are not a neutral resource transfer to disadvantaged sections of society. In addition to undermining the efficiency and credibility of the financial sector, subsidies in this form perpetuate dependency on an overstretched government -- and ultimately on donors whose priorities may change. Equally important, they inhibit the development of local institutions that are accountable to the target group and capable of becoming self sustainable. In other words, the default subsidy offers the opposite of empowerment to the poor and disadvantaged groups it purports to help. It is, as Jack Ives said yesterday, "Charity instead of exchange of gifts" which only perpetuates the marginality of mountain peoples.

The Concept of Social Intermediation

But reaching poor men and women in mountain areas is expensive -- especially the way it is being done now in Nepal. So how do we get around the apparent contradiction between outreach to disadvantaged groups and long-term financial sustainability? To do this, I believe we have to recognise the special barriers that face poor mountain people. Nepal's difficult terrain and low levels of physical infrastructure and human resource development make it extremely difficult to bridge the gap between agencies charged with service delivery and those they are supposed to assist.

To help overcome this gap, formal financial intermediation must be paired with social intermediation through groups. Social intermediation attempts to link those beyond the frontier of formal finance with formal financial institutions and other government services that may make them more productive and able to lead more satisfying lives.

The development of intermediated groups generally works as a two stage process. In the first stage an outside intermediary institution works either to identify or activate existing local groups or to stimulate their formation. The intermediary seeks to develop the skills, confidence, and discipline of these groups to the point at which they can establish their own relationships with formal institutions, no longer depending on the intermediary The capacity of a group to deal directly with formal institutions marks the threshold of the second stage. When this occurs the formal institution's costs of maintaining the relationship decrease substantially.

Without social intermediation many people in remote mountain areas would face almost insurmountable barriers in getting access to services. These barriers include:

- gender;
- tribal or ethnic background (e.g., membership in a minority group or, in Hindu areas, low caste status);
- illiteracy -- and related to this a broader problem of unfamiliarity with the systems and procedures of formal institutions which I call lack of "bureaucratic know-how"; and

- lack of assets or property to offer as collateral -- for women this is particularly problematic since the traditional patrilineal transmission of land almost ensures that they will not have land to pledge as collateral for a loan.

In addition, location in the mountains means potential clients also face:

- long distances to services;
- poor physical infrastructure; and
- undeveloped markets.

Social Intermediation through Groups

Nepal has pioneered one of the most promising forms of social intermediation based on group formation. Group-based lending was introduced in Nepal more than 15 years ago by the Small Farmers' Development Project (SFDP) and incorporated into the Production Credit for Rural Women Project (PCRW) five years later. Best known from the work of Grameen Bank in Bangladesh, this approach has emerged in poverty-lending programmes in many other countries, including MYRADA and SAMAKYA in India, Ikhtiar in Malaysia, and others.[2]

When they are cohesive, voluntary associations or groups serve multiple purposes for their members and for the financial and other service delivery institutions to which they are linked. Many groups, like the two studied in Nepal, offer joint liability for their members' debts. For landless men and for women this kind of alternative or substitute collateral is essential; without grouping it is unlikely that they could obtain formal credit. Savings mobilised by groups are often relent to their members for emergencies, consumption, and similar purposes for which formal institutions are reluctant to lend.

For lenders, sustainable, well-functioning groups can reduce transactions' costs and risks in reaching dispersed individuals. Group lending can reduce the lender's administrative overhead once the relatively high initial costs of organising and making groups functional are incurred. Groups in some programmes have demonstrated an impressive ability to mobilise savings, which can reduce the lender's dependence on external funds. Workable joint liability arrangements can reduce repayment problems. When all members lose borrowing privileges until default by any member is resolved, external enforcement is less important because the group is self-policing, encouraging timely repayment.

Cohesive groups, consisting of members with common interests in training and use of other enterprise development services, can be cost-effective delivery mechanisms. Groups of micro-entrepreneurs who have little formal education have proven to be effective channels for training and market information and can reinforce key training messages

[2] See the Foundation for Development Cooperation's "Banking with the Poor" for an excellent description of the approach and an up to date inventory of its many different manifestations in the Asian region.

and behaviour. Groups are also effective as channels for social service programmes, including adult education, nutrition, family planning, and health. In Nepal they have also been successfully used to organise the construction of community infrastructure such as schools, drinking water systems, tracks, and community halls.

Group-based Lending and Gender

For Nepalese women, groups have had an added benefit. They have created a legitimate social space for women beyond the home and a sense of solidarity that allows them to deal more freely with unfamiliar formal institutions and processes. In a country like China this may seem unnecessary, but, in Nepalese society, helping women learn how to get access to services and to deal with male bankers and extension agents are no small achievements. In many cases the increased confidence and "bureaucratic know-how" they have gained is as important as the extra income they have earned through the loans they have taken.

The support women have received from their membership in PCRW credit groups can bring about important changes in their lives. For example, in one community visited by the research team, several low-caste girls were returning to their village after attending a weaving training activity run by the PCRW programme when one was attacked and narrowly escaped being raped by two local high-caste men. Although there was a long-standing pattern of such abuse in the community, the girls reported the incident to their group and to the Woman Development Officer who decided to take action. Instead of being ignored, as in the past, the incident was brought before the VDC and punishment was given, including a public apology by the men. A similar response to the common practice of wife beating occurred in another PCRW village site. Group members met and, with help from the Woman Development Officer, took several complaints to the district magistrate. The frequency of wife beating in the community, even of non-group members, dropped sharply and remains low.

Dimensions of the Social Intermediation Process

Groups offer a mechanism that potentially contributes to financial sustainability and social outreach simultaneously, even though these objectives are often seen as conflicting. Linking institutions and individuals, group formation can build "institutional capacity" from two different directions. It can extend the outreach of formal institutions that lack either adequate physical presence or the interpersonal skills to serve people in remote mountain areas. From the other direction, group formation can develop clients' skills and "bureaucratic know-how" to effectively interact with outside institutions. Group formation is the introduction of new systems for doing business, the development of new contracts between marginal groups and formal institutions.

The contribution of groups of sustainable financial intermediation can be measured by customary tests of financial viability. Their effectiveness in social intermediation can be assessed along two dimensions. The first is increased target group access to services and inputs. The second dimension is much more difficult to measure: the development of awareness, self-confidence, and management skills by group members. The second

dimension manifests itself in a number of ways but initially and most importantly through the group's own achievement of self-reliance. Ultimately, it is the cohesiveness and self management capacity of groups that enable them to bring down the costs of financial intermediation.

Success and Failure in Nepal

I wish I could report that the two group-based lending programmes in Nepal have been a total success in achieving both access and financial sustainability. But, unfortunately, the study we have just completed shows they are only half way there. The SFDP and PCRW groups appear to be a great success in widening target group access. Both have helped people in remote mountain areas obtain access to services formerly not provided by private or government delivery systems. Credit groups from both programmes have been used by government and donor agencies as a channel for both social and production support services, as well as rural infrastructural development.

PCRW data from 1991 show that, while only about 10,156 women had borrowed, the programme has reached more than 250,000 men, women, and children with day-care services; forestry, agricultural and animal husbandry extension; adult literacy classes; and construction of drinking water systems, schools, paths, and bridges. Drinking water was made available to 45,000 persons; 18,000 completed 6-month adult literacy courses; health and sanitation programmes involved over 62,000 people; and forestry and environmental protection programmes benefitted more than 14,500.

SFDP groups benefit from a similar range of non-financial community development services, even though social service delivery receives relatively less emphasis while technology transfer and infrastructural development, particularly irrigation, receives relatively more than in PCRW. Cumulative data from 1990/91 show that 15,910 small farmers obtained access to some form of irrigation through the programme. A total of 1,817 drinking water systems, 871 trails, and 174 bridges have been constructed and 871 canals repaired through SFDP. Moreover 61,646 group members (of which 36,961 were women) have received adult literacy training.

An impact evaluation study by Nepal's Central Bank in 1991 found that SFDP group members had better access to veterinary and agricultural extension services than the control group (38 per cent versus 28 per cent for veterinary and 25 per cent versus 18 per cent for extension). The 1987 evaluation of SFDP showed that the programme had brought about, or was associated with, improvements in a number of social indicators among group members. Over a four-year period, family planning in SFDP households had increased from 24 per cent to 30 per cent;[3] houses with their own latrines had increased from 24 per cent to 32 per cent; houses where women had to walk less than 15 minutes to fetch clean drinking water had increased from 65 per cent to 89 per cent. School enrollment for group members' children aged 4-14 also improved: boys' enrollment rates rose from 55 per cent to 74 per cent and girls' from 30 per cent to 41 per cent.

[3] The 1991 impact study by the Central Bank showed a similar pattern with 42 per cent of the farmers in the project areas adopting family planning in the project areas compared to 28 per cent in the non-project areas.

Despite widespread success in improving service delivery, group progress towards self-reliance is much less encouraging in both programmes and -- as I mentioned in the beginning -- the costs to the programmes from non-repayment of loans have been unacceptably high. I believe that this is because, in most cases, government and donors have focussed more on disbursement of credit than on developing self-reliant groups and establishing systems that weed out poor credit risks and motivate borrowers to repay.

As supply-led systems, PCRW and SFDP tend to over finance group member's investments. The loans usually cover the full amount required for a sub-project rather than encouraging the borrower to take an equity share in the investment. Without sharing the investment risk, borrowers may be tempted to take on riskier investments or increase the scale of traditional sub-projects beyond their management capacity. A "worst case" scenario would combine over financing with unclear credit contracts, poor record keeping, sporadic monitoring, and little or no technical backstopping by line agencies. This recipe for disaster is present in many of the PCRW and SFDP sites, and it contributes to low repayment rates and loan fund decapitalisation.

Yet, in our site visits all over Nepal we found strong groups that had been saving, borrowing and repaying steadily for eight years and more. And in one district supported by the German GTZ, where over the last three years there had been a serious effort to develop self-reliant groups through investment in intensive training and monitoring, the progress had been remarkable. Groups had federated into a 3-tier structure; they elected their own leaders, and collected substantial savings which they were relending with almost perfect repayment.

Achieving Access and Sustainability

Existing financial outreach to poor mountain people in Nepal contains two related flaws. An example of the first is livestock loans for the purchase of large animals by poor women who are not experienced or trained in husbandry for buffaloes or for the breeds obtained. The second is represented by PCRW groups who borrow repeatedly, repay satisfactorily, and save systematically. These women still face the same procedures for obtaining new loans as they did when they first borrowed. In the first case, too much is given too soon; in the second, too little is offered too late. In each case potential is wasted and efforts misdirected.

The most apparent new idea for self-sustaining growth is to offer different levels of access to different types of clients, matching clients' debts and savings with their capabilities as demonstrated by their performance. This recommendation is essential for sound and clear financial contracts. The second obvious new idea is a necessary complement to the first: provide scope for growth and development of relationships between clients and financial intermediaries. Social intermediation can accelerate this process significantly.

The Nepal experiment with group-based lending to the poor is still far from conclusive. But one thing we have learned from Nepal and from some of the other successful group-based programmes in Asia (like MYRADA and Grameen); for disadvantaged groups, investment in social intermediation must precede financial intermediation.

What the poor need from government and from donors is not massive flows of cheap credit that they are not really expected to repay. This only perpetuates their dependency on those outside their community, weakens their bargaining power, and increases their marginality. What the poor need is:

(a) the establishment of sustainable systems for financial services that they can count on as long as they prove themselves credit worthy through prompt repayment, and

(b) investment in their own human resources -- the skills and information they need to enable them to share in the management of a system that is accountable to them.

Part Three

Poverty and Mountain Development

The Experience of China

CRITERION FOR DEFINING CHINA'S POOR AREAS

Xiao Youen, Wei Zhonghai
Wang Qizhong, Yi Fahai
Ma Yanning

In order to launch a campaign for poverty alleviation, it is essential to define poor areas on the basis of an objective criterion. The present research was initiated in 1988 in order to establish a set of comprehensive statistical indicators for assessing poor areas in China.

Poverty is an economic concept. Poverty is manifest in such aspects as economy, social welfare, and people's cultural levels. However, its essential characteristic is economic poverty. Poverty can be divided into absolute poverty and comparative poverty. Absolute poverty refers to the economic condition in which the gain in material means of subsistence cannot meet the most basic needs that enable labourers and their families to meet the cost of living. Comparative poverty refers to economic conditions that are below the moderate living standards of a given district. It demonstrates the differences in inter-regional and inter personal living standards. Comparative poverty is determined by imbalances in social and economic development. In the primary stage of socialism in China, we cannot completely wipe out poverty, we can only change the differentiating criterion of comparative poverty. With the pace of development, absolute poverty will be turned into comparative poverty.

Section A

Poverty Classification in China

CRITERION FOR DEFINING CHINA'S POOR AREAS

Xiao Youen, Wei Zhonghai
Wang Qizuang, Yi Fahai
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Poverty can be appreciated as a spatial, community, household, or individual process. Poor areas refer to those areas in which a poor economy exists and in which the residents' mean living standards cannot satisfy the most basic demands for food and shelter. In China, the poor are mainly concentrated in rural areas. Owing to the different degrees of poverty among the districts, we divided poor areas into extremely poor areas and poor areas. Extremely poor areas refer to areas in which the economy is so poor that the residents barely have a hand to mouth existence.

1. An Appropriate Research Unit for Poor Areas

In China, for the following reasons, the appropriate research unit for the study of poor areas should be the county.

1. The county is China's basic administrative unit and, for the most part, it is homogeneous in terms of natural conditions, economic conditions, and levels of economic development.

2. The county economy is mainly a rural economy. China's poor areas are mainly rural areas.

3. The county is the unit for which basic social and economic data are available. Historical statistical data can also be used in the analysis of county level data.

2. Classification of China's Poor Areas

China has a vast territory. Climatic conditions are different from place to place. There is also a lot of difference in residents' living and consumption habits in such basic items as food, clothes, heating, etc. In a big country, such as China, it is impossible to use a national criterion to define poverty. There would be too many classifications. Subsidised areas would create further problems. To deal with this problem the cluster analysis method was used to re-classify China's 18 special-purpose, interest-subsidised loan-supported poor areas.

The three principles of classification are as follows:

1. homogeneity in climatic and other natural conditions,
2. common consumer habits and consumption structures, and
3. integrity of the administrative unit at the provincial or district level.

The classification process is as follows.

1. In order to use cluster analysis, seven indicators were selected as cluster elements. These included the percentage of mean expenditure on food, clothes, fuel, daily necessities, cultural services, living services, etc to the mean living expenditure, and the percentage of mean living expenditure to mean net income.
2. The means of the seven elements for 18 areas were traced back to 1985, for which year base-line data were available.
3. A comparison was made between two samples.
4. Poor areas were classified by making use of dynamic clusters, systematic clusters, and fuzzy clusters to repeatedly calculate and compare. The best result was used to classify China's poor areas into three categories.

   i) Yun-Gui region, including Yunnan Province and Guizhou Province.

   ii) Southern region, including Sichuan Province, Henan Province, Anhui Province, Jiangxi Province, Zhojiang Province, Fujian Province, Guangxi Province, Hunan Province, Hubei Province, etc.

   iii) Northern region, including Liaoling Province, Neimong Province, Hebei Province, Shangdong Province, Shanxi Province, Lingxia Province, Qinghai Province, Xinjiang Province, Shannxi Province, Gansu Province, etc.

In addition, every county in the northern area was divided into farming counties and pastoral counties. The results match with the division made by the National Statistical Bureau.

3. Comprehensive Evaluation Indicators and a Statistical Model of the Degree of Poverty in Different Areas

Choice of Indicators

The comprehensive evaluation indicators to judge the level of poverty in different counties were chosen based on the following principles:

i) the indicator should describe the economic condition of poor counties,

ii) the information should be easy to collect; possibly through annual reports of rural economic statistics published by the national statistical department, and

iii) the indicators should be comparable across different times and in different districts.

Accordingly, 11 indicators were chosen from five aspects to describe the economic conditions of poor counties.

1. Indicators Reflecting the Level of Rural Production

   i) Mean value of the total rural production of the county (*yuan*).

   ii) Mean value of the total industrial and agricultural production of the county (*yuan*).

   iii) Mean value of the total agricultural production of the county (*yuan*).

2. Indicators Reflecting the Condition of the Rural Industrial Structure

   i) Ratio of the county's total agricultural production value to total non-agricultural production value.

   ii) Percentage of the county's total rural industrial production value to total rural industrial and agricultural production value. Generally speaking, the poorer the economy of the area the less the percentage of total production value to total industrial and agricultural production value.

3. Indicators Reflecting the Level of Rural Residents' Income

   i) Mean annual net income of the county's rural residents (*yuan*).

   ii) Mean annual income of the county's rural residents.

4. Indicators Reflecting the Degree of Agricultural Commodity Production. This is indicated by the percentage of the county's rural agricultural and side-line production to the total rural production value. This indicator is positively related to agricultural production.

5. Indicators Reflecting the Level of Rural Residents' Consumption

i) Mean annual living expenditure of the county's rural residents (*yuan*).

ii) Mean annual per capita grain available to the county's peasants (in *jin*, of which one is equal to 500g).

iii) The percentage of expenditure on food compared to the total expenditure on living, which is also called the Engel co-efficient.

Choice of Samples and Proof of Data Reliability

Based on the economic statistics data for rural counties, published by the National Statistics Bureau (1985), 728 rural counties were chosen as the sample. Among these, 636 counties are defined as poor counties and 92 counties are non-poor counties lying in poor areas. Some non-poor counties were represented in the sample, because the climate, resources, and farming methods in the non-poor counties are roughly similar in the same district. The non-poor counties were chosen also for comparative analysis. It was assumed that the national definition of poor counties is, to a certain degree, reasonable and people's qualitative understanding roughly confirms to our definitions of the poor counties. The 1985 data were used because the first year of the 7th Five-year Plan emphasised poverty alleviation and the definition of poor areas. The annual data of more than 600 poor counties from 1985 to 1987 were analysed and a dynamic regression model was established.

Establishment of a Statistical Model

Principal component analysis and stepwise regression analysis were used to develop the model. This yielded the following results.

Yun-Gui region, 83 counties in the sample. The equation of regression is:

$$Y = -30.82+0\ \ 0591X_1-1.5802\ X_2+0.2246\ X_3 \qquad (1)$$

Southern region, 255 counties in the sample. The equation of regression is:

$$Y = -10\text{-}52+0.0179\ X_1-3.0706\ X_2+0.1736\ X_3 \qquad (2)$$

Farming area in the Northern region, 149 counties in the sample. The equation of regression is:

$$Y = -4.97-0.0191\ X_1-0.5502\ X_2+0.1363\ X_3 \qquad (3)$$

Pastoral area in the Northern region, 53 counties in the sample. The equation of regression is:

$$Y = -23.21+0.0144\ X_1+0.0983\ X_3 \qquad (4)$$

In the above equations of regression, X_1, X_2, X_3 respectively represent the mean annual agricultural production value of the county, the percentage of the county's total agricultural production value to total non-agricultural production value, and the mean annual net income of the rural residents in the county. These three indicators show three qualitative characteristics: the level of agricultural productivity, the condition of the rural production structure, and the level of rural residents' income. X_1 is calculated according to constant prices in 1980, X_2 is calculated according to the prices in a given year, and X_3 is calculated according to comparable prices in 1985.

Mean net income (X_3) is mainly used for rural residents' living expenditure, so it is necessary to take price fluctuations into account while calculating the comprehensive evaluation indicator for other years. Price fluctuations mainly influence peasants' expenditure on commodities. The percentage of peasants' expenditure on commodities to their total living expenditure has been taken as 58 per cent, which was the national average from 1981 to 1985. If X_3 was mean net income during the reporting period, and P the price index of the basic year, the calculation of mean net income (X_3) after deducting the element of changing prices is:

$$X_3=0.42X_3+0.58X_3/P \qquad (5)$$

4. The Criterion for Classifying Levels of Poverty in Different Poor Areas

The degree of poverty and the classification of counties by the degree of poverty was based on the numerical values shown in Table 1.

Table 1: The Poverty Criterion and Alleviation of Poverty in Different Areas

Region	Formula for calculating poverty and degree of poverty	Poverty criterion and alleviation of poverty		
		Extremely poor counties	Poor counties	Non-poor counties
Yun-Gui	$Y=0.0591X_3-1.5802X_4+0.2246X_6$	Y <58.8	55.8 <Y <77.1	Y > 77.1
Southern	$Y=0.0179X_3-3.0706X_4+0.1736X_6$	Y <43.5	43.5 <Y <80.0	Y > 80.0
Northern farming	$Y=0.0191X_3-0.5502X_4+0.1363X_6$	Y <40.8	40.8 <Y <58.5	Y > 58.5
Northern pastoral	$Y=0.0144X_3+0.983X_6$	Y <41.1	41.1 <Y <59.8	Y > 59.8

Note: The formulae for calculation are equations 1....4 without the constants.

The points of partition can be calculated for every corresponding indicator by using the concept of concentrate interval.

We call $[h_{k1}, h_{k2}]$ the concentrate interval of point h_j, if $H = \{h_2, h_3 ..... h_n\}$ is an ordered data sequence, h H, and moreover $1 < j < h$ are the specially significant points in H. If the interval $[h_{k1}, h_{k2}]$ satisfies the following condition:

$k_1 < j < k_2$, for any l_1, l_2, when $1 < l_1 < j < l_2$, we have the formula.

$$\sqrt{\frac{k_2(h_i-h_j)X(h_i-h_j)}{i=k_1(k_2-k_1+1)}} < \sqrt{\frac{l_2(h_i-h_j)x(h_i-h_j)}{i=l_1(l_2-l_1+1)}} \quad (6)$$

Suppose Y_j is a point of partition, let the corresponding indicator element be $X_{j1}, X_{j2}, \ldots X_{jm}$. When calculating the mean, $X_1, X_2, \ldots X_m$, of the value of the elements included in the concentrate interval and the variance, $0_1^{-2}, 0_2^{-2}, \ldots, 0_m^{-2}$, we take $[X_1 - 0_1, X_1 + 0_1]$, $[X_2, 0_2, X_2 + 0_2]$, ... $[X_m, 0_m, X_m + 0_m]$ as the approximate numerical value having a range of $X_{j1}, X_{j2}, \ldots X_{jm}$. Table 2 shows the partition values for Poor and Extremely Poor counties with respect to a number of indicators.

According to the criterion in Table 1, and the data for 297 poor counties which were supported by a national special purpose loan in 1985, we calculated and found that 294 counties are classified into poor counties, with the rate of coincidence at 99.2 per cent. According to the National Criteria of Nutrition and Hygiene drawn up by the China Physiology Association and their units, the per capita kilo calories consumed by Chinese people is 2,350kc. The kilo calorie figured out in Table 2 roughly conforms to the two above-stated criteria.

Table 2: Interpretation of Economic Implications of the Degrees of Poverty

Region	Degree of poverty	Comprehensive evaluation indicator value	Mean net income/capita of rural residents	Mean total agri. production value per year of agri. working force	Times of total agri. production value against total non-agri. production value	Mean annual grain availability per capita (*jin*)	Daily calory food per capita (kc)
Yun-Gui	Extremely poor counties	55.8	154.1±10.27	443.3±26.39	4.9±0.49	450	2330
	Poor counties	77.1	228.7±12.33	519.1±28.94	3.4±0.31	470	2410
Southern district	Extremely poor counties	43.5	229.8±2.52	627.2±29.00	2.9±0.25	475	2388
	Poor counties	80.0	369.6±4.41	1137.6±63.66	2.5±0.17	504	2450
Northern farming district	Extremely poor counties	40.8	219.4±14.00	795.4±81.95	2.8±0.59	455	2340
	Poor counties	68.5	350.0±10.23	1257.6±91.25	3.2±1.00	487	2487
Northern pastoral district	Extremely poor counties	41.1	279.3±16.93	1138.2±134.5		440	2380
	Poor counties	59.8	401.1±12.47	1843.5±112.12		482	2501

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RESEARCH ON CLASSIFICATION AND DEVELOPMENT OF THE POOR AREAS IN CHINA

Jiang Dehua

Introduction

There are 664 officially designated poor counties in China, excluding Xizang (Tibet) and certain minority areas of western Sichuan which fall under special minority administration.[1] Of these counties, 434 belong to the 18 delineated poverty regions identified by the central government,[2] 251 of which are supported directly by the central government with interest discount loans (and additional special funds for the "three west regions"[3]), while the remaining 183 are supported by their provincial (or autonomous region) governments with a combination of provincial and central government funds. Of the 230 counties which do not belong to the 18 regions, 51 counties are supported directly by the central government and 179 by provincial governments. The 664 poorest counties can be divided into three categories, according to average income per rural resident.

The poorest category includes 97 counties with average per capita net incomes of less than 150 *yuan*. These have a population of 16.566 million receiving less than 200 *yuan*/capita, which accounts for 57.49 per cent of this area's rural population.

The middle category includes 146 counties, with average per capita net incomes of 150-200 *yuan*, and a population of 24.217 million receiving less the 200 *yuan*/capita, accounting for 48.31 per cent of the rural population.

The remaining category includes 421 counties, with average per capita net incomes exceeding 200 *yuan*, but with a population of 51.903 million receiving less than 200 *yuan*, accounting for 39.22 per cent of the rural population.

The impoverished areas of China are mostly situated in remote and, especially, mountainous regions, old revolutionary bases, or regions with significant proportions of minorities among their populations. Seventy-eight per cent of the counties (including those in Tibet) are concentrated west of a relatively continuous line running from south

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2 The 18 poor regions are: (1) the Qinba mountains, (2) the Wuling mountains, (3) the Wumeng mountains, (4) the Dabie mountains, (5) the Southern Yunnan mountains, (6) the Hengduan mountains, (7) the Taihang mountains, (8) the Luliang mountains, (9) the North-western Guangxi mountains, (10) the Jiu-wan-da-shan areas, (11) the Nuluerhu mountains, (12) the Xihaigu areas, (13) the Dingxi areas, (14) Tibet, (15) the South-western and North-eastern Fujian revolutionary bases, (16) the Northern Shaanxi revolutionary bases, (17) the Jinggang mountains and Southern Jiangxi revolutionary bases, and (18) the Timeng mountain revolutionary bases.

3 The "three west regions" include the Gansu Corridor, the Dingxi arid areas of Gansu, and the Xihaigu areas in the southern Ningxia mountains.

of the Greater Hinggan Mountains between Hoilong-jiang and Inner Mongolia to the Bashang Plateau in northern Hebei; the Taihang mountains between Hebei and Shaanxi; the Wushan mountains in Hubei; the Wuling mountains bordering Hunan, Bubei, Sichuan, and Guizhou; the Miaoling mountains in southern Guizhou; and finally to the Karst Region of Guangxi and Yunnan. This is in sharp contrast to the poor areas of eastern China which are like isolated islands. The east-west differences in poverty distribution are much larger than the north-south differences.

Many unfavourable factors contribute to poverty in these poorest regions.

Deteriorating Natural Conditions

Soil erosion in the mountains, drought in the northwest regions, flood and waterlogging in areas that are intersected by mountains and plains; lack of soil and water in karst areas; poor red soil in the south China hills; and poor soil, drought, waterlogging, salinity, and alkalinity in the north China lower plains. These contribute to a vicious circle of poverty in terms of natural conditions associated with agriculture.

Special Historical Factors

Throughout recorded history the living conditions in some of the minority nationality areas have been poor. Even in the 1950s, some of these societies could be considered technologically backwards and primitive, and today they are still among the poorer areas of China.

Out-of-date Modes of Production and Undiversified Industrial Structure

The major products of the poor areas are staple food crops. Industry and sideline activities are less developed than in other areas of China. Only the simplest farm tools, such as bamboo and wooden ploughs, predominate in some remote areas. Chronic low and unstable yields and even slash-and-burn methods may still be found.

Underdeveloped Transportation and Information Systems

Many poor areas cannot be reached by road and have no telecommunications. Mountain trails are difficult to travel. People therefore have little connection with the outside world.

An Enclave Outlook, Exacerbating and Reflecting an Undeveloped Commodity Economy

An enclave attitude influences people in some regions to stay in their home villages rather than sell their products or provide surplus labourers to other areas.

Rapid Increase in Population without Adequate Economic Growth

The natural population increase in poor areas is about two to three per cent per annum. The dependent proportion (old, very young, disabled, and occupied but unremunerated people) who cannot support themselves is more than 60-80 per cent. Diseases are

prevalent because of low-quality medical facilities and poor health conditions, as well as low levels of food intake and specific nutritional deficiencies. One or more endemic diseases prevail in 73 per cent of poor counties.

Low Quality and Availability of Education

The proportion of illiterate or semi-illiterate persons is 35-55 per cent in most poor areas. The number of teachers per hundred thousand students is 600-900, lower than the national average of 956.

Many of these factors are results as well as causes of poverty in these regions.

Because of the above conditions, some of which have been exacerbated by misguided policy decisions, poverty has continued to persist and presents a national problem. A series of readjustments and reforms in recent years have been aimed at solving the poverty problem.

The Basis for Classifying Poor Areas

Several principles should be considered when developing a system of classification for China's impoverished areas.

General Similarities in Natural, Social, and Economic Conditions.

Natural conditions include climate, topography, and natural resources. Social and economic conditions include population density and distribution, nationality, educational levels, transportation, living standards, and overall development.

Major Natural, Social, or Economic Factors Which may be Critical for Defining Poverty in a Particular Region

The poverty of Inner Mongolia and the Xinjiang Autonomous Region is closely associated with drought. The poverty pattern of the gully areas in the Loess Plateau is strongly associated with soil erosion. The poverty pattern of the karst mountains in South-western China is caused by large and pronounced karst areas.

County Boundaries as Basic Units for Regional Composition

Six hundred and sixty-four counties are poor areas by official designation as of 1987. Provinces, and even prefectures, as units of aggregation, are too large. The numbers of townships and villages are too unwieldy; availability of data for the latter, as well as for prefecture aggregations, is problematic.

The Current Perception of Appropriate Measures for Alleviating Poverty

According to the principles for identifying the poor areas described above, the poor areas in China can be classified into six patterns and 21 sub-patterns as given in the following passages.

1. The Loess Plateau

Bound by the Qinling and Funiu mountains in the south, the Great Wall in the north, the Taihang mountains in the east, and the Riyue mountains in the west, the entire Loess Plateau includes a large area of 226 counties and municipal areas covering 406,000 square kilometres. One hundred and two counties are officially designated as impoverished in central and eastern Gansu, the southern Ningxia mountains, and the plateaux of western Shanxi and northern Shaanxi.

Seventy per cent of the Loess Plateau is characterised by loess layers, 10-200 metres deep, with some scattered stone or rock mountains. The loess is composed of loose and loamy soil, good for farming. Per capita cultivated land is officially estimated at two to three *mu* -- higher than the national average.

Coal, oil, and waterpower are abundant. The areas yield (136,400 million tonnes of reserves in Shanxi and Shaanxi coal fields in 1985) 40 per cent of the country's total coal output. Major power stations in or near the area are in the Longyangxia, Liujiaxia, Bapanxia, Yanguoxia, Qingtongxia, Sanshenggong, Tianqiao and Sanmenxia gorges, with a total generating capacity of 23 million kilowatts. The Huangho River Basin has a total of 40 million kilowatts of waterpower potential, 26.5 million kilowatts of which is associated with the main channel.

Mountains, ridges, mounds, and mesas as well as level ground, basins, valleys, and gullies, make the topography of the area complicated. For centuries the Loess Plateau has been known as the birthplace of ancient Chinese culture and the cradle of the Chinese nation. People have accumulated traditional expertise with animal husbandry and dry farming. Stony and rocky mountains and loess hills are utilised for forestry and animal husbandry; desert or semi-desert areas are used for animal husbandry, mesa is used for dry farming, and valleys are used for diversified economic and farming activities.

Serious natural difficulties constrain prosperity in this area.

Soil Erosion

The loess is made up of fine sand, 60 per cent powder. Erosion caused by loess soil, sparse vegetation, and frequent rainstorms in summer is among the most extreme in the world. Eighty per cent of the total area and most of the poor counties have a serious erosion problem. The average annual volume of soil erosion equals 3,000-10,000 tonnes per square kilometre in the lower reaches of the Kuyiehe River at Shienmu county (35,000 tonnes).

Drought

The plateau is situated in the transitional space between eastern monsoon China and northwestern arid China. The climate ranges from semi-humid to semi-arid and arid. The annual average temperature ranges from 6° to 14°. The annual frost-free period varies considerably within the region, ranging from 110 days to 250 days. Decreasing from southeast to northwest, the mean annual precipitation is 600-700mm in the

southeast and below 300mm in the northwest. Seasonal distribution of precipitation is uneven. Seventy per cent of the precipitation occurs in the months from June to September, usually in the form of storms. Since only fifteen to twenty per cent of the precipitation occurs during winter and spring, spring drought is severe. Sometimes mid-summer to autumn droughts also occur. Hot and dry winds and frequent sandstorms aggravate drought conditions, making farming and many activities difficult. Drinking water for people and livestock is inadequate in many areas.

Shortage of Fuel, Feed, Fertiliser, and Timber

The Loess Plateau was once covered with dense forests, lush grassland, abundant resources, and fertile soil (during the Xi and Zhou Dynasties, 32 million hectares, or 53 per cent of the area, was forest). Since the Qin and Han Dynasties, however, forests and grassland have been partially destroyed as a result of immigration to the frontier, poorly managed and conceived reclamation of wastelands, civil war, and development of industry and roads. A vicious circle of increasing degradation and poverty arose as farming was clumsily developed, while forestry and animal husbandry weakened; soil erosion increased; and regional availability of fuel, feed, organic fertilisers, and timber decreased.

Spread of Endemic Diseases

Diseases seriously endanger people's health and have become important limiting factors in regional development. One of the main endemic diseases, Keshan disease, prevails in 29 counties (28 per cent of the 102 poor counties), with an associated morbidity rate of 5-60 per cent. Thyroid swelling is found in 25 counties (23.5 per cent), with a morbidity rate of 3-10 per cent. Kaschin-Beck is found in 41 counties (40 per cent), with a morbidity rate of 1-15 per cent. Fluorine poisoning is found in 66 counties (64.7 per cent), with a morbidity rate of 0.1-7.0 per cent. Lung cancer, tuberculosis, and other infectious diseases also exist in the area.

Low Agricultural Productivity

Foodgrain yields in the Loess Plateau are low and unstable -- averaging about 1.5 tonnes per hectare. Oil crop yields are substantially lower. In times of drought, it is difficult to save seeds in some of the areas, endangering subsequent production. Annual average foodgrain availability per rural resident was 269 kilogrammes in 1986. But this quantity must cover not only food, but allocations for feed, seed, cash sales, and storage, as well as waste.

Given an understanding of the above problems, it is possible to outline directions that future development should take. Accordingly, the following major management efforts are proposed.

Afforestation and Management of Forests and New Grasslands. Efforts need to be made to increase forestry and animal husbandry. Loess hills with gullies should be reforested. Farming needs to be integrated with forestry and animal husbandry. In high altitude areas the major attention should be given to developing forestry.

Change to Intensive Farming. In better farmlands the emphasis should be on intensive, high-yielding cultivation. If necessary, moving mountain communities ("suspended villages") with serious soil erosion problems to valley areas may be considered.

Contracts for Comprehensive Management of Basins. Watershed management has been an effective measure for many years. Contracts will allow for management by integrated households, integrated villages, and integrated counties.

Development of a Commodity Economy. Considerable development of the commodity economy is needed. Agriculture, forestry, and animal product processing needs active attention, along with local mining, transportation system, rural trade, and service sectors.

Four sub-patterns characterising the Loess Plateau poor area can also be delineated and specific measures designed to help these areas.

The Central and Eastern Gansu Arid Plains and Hills' Region

Here major emphases should be on grassland conservation; rational utilisation of valleys for agriculture; widespread planting of trees; and development of industry and sideline production.

The Southern Ningxia Mountain Region

The area includes eight poor counties. Emphases should be on afforestation and integrated development of animal husbandry and agriculture.

In the Yantong and Xiangshang Mountain areas, there is potential for processing animal products. In the Liupan Mountain areas there is potential for processing forestry products. In the Qingshuihe, Honghe, and Ruhe valley areas there is potential for combining industry and sideline production.

The Northern Shaanxi Plateau Region

Thirty of the 40 counties in the area are poor counties. Emphases should include water and soil conservation, windbreaks and sand control, biomass development, and improving the environment for agriculture.

The Luliang Mountain Region of the Western Shaanxi Plateau

Twenty-four of the 27 counties in the area are poor. Emphases should be on forestry and the development of forest-based industries, soil conservation and checkdams, and afforestation.

2. The Border Area between the Eastern Plains and Western Mountains

One hundred and seventy-seven of China's poor counties are concentrated here -in the Bashang Plateau and the Taihang, Qinling, Daba, and Wuling mountain areas.

The distinguishing characteristics and advantages of the area relate to its varied topography and climate types. There are steep mountain areas with deep gullies, basins, valleys, and foothills which connect with eastern China's great plains.

From east to west there is a change from a humid/semi-humid climate to a semi-arid or arid one. From north to south there is a temperature transition. The altitude and humidity axes intersect near the Tongbai mountains in Henan Province. The regional diversity caused by such transitions provides sharper distinctions from east to west than along the north-south axis.

Because of the wide range of natural conditions, land in this area is suitable for many purposes. Measures should be taken which take into account each sub-region's special combination of resources and manpower. Development of mining, industry, and a diversified economy is possible, along with forestry, animal husbandry, and farming.

The major problems associated with poverty in this area include the following.

The Frequency of Natural Disasters

Sudden flooding, earthquakes, and frequent widespread and prolonged droughts are more typical of this region than in most of the rest of China. There was extensive flooding of the Changjiang River in 1854 on a catastrophic scale, in the Taihang mountains in 1963, and in the western Henan mountains in 1975. There were disastrous earthquakes in Xingtai in 1966 and in Tangshan in 1976.

High Prevalence of Endemic Disease

The area is particularly known for Keshan, Kaschin-Beck and thyroid diseases. In 21 counties more than three endemic diseases are prevalent. The incidence of endemic disease in this region accounts for more than 86 per cent of the country's estimated case total of such diseases.

Inappropriate Use of Resources

Mismanaged reclamation, wanton felling of trees, and environmental degradation associated with mining development are common problems. The integration of farming with forestry and animal husbandry has not been handled properly.

Integrated Harnessing of Mountains and Rivers

Four of China's large rivers (the Changjiang, Huanghe, Huaihe, and Haihe rivers) flow across the mountains of this area. Water control has traditionally ignored the exploitation of land. Irrigation projects have been blocked or washed away threatening lower river reaches. Twenty-nine large and medium-sized reservoirs in the Haihe Basin can be considered dangerous, because these are mostly located in the Taihang and Yanshan mountain areas.

Irrational Industrial Structure

Even though the area is suitable for many activities, forestry accounts for only 8.5 per cent of the gross value of rural output, animal husbandry accounts for 22 per cent, and rural industry and sideline production account for 9.3 per cent -- totalling about 40 per cent. This does not match the potential of an area featuring mountains, forest, grassland and abundant mineral resources.

The following are some of the important measures that need to be taken in developing the area.

Afforestation and Harnessing of Mountains and Rivers. Both biological and engineering methods should be applied to harnessing mountains and rivers together. Water and soil conservation should be increased through afforestation.

Readjustment of Industrial Structure. Contradictions in the way farming, forestry, and animal husbandry are carried out must be eliminated. Key measures should be carried out in controlling the destruction of forests and grassland; expanding high and stable yield crops; increasing self-sufficiency in food production; and providing a rational arrangement for production in the farming, forestry, and animal husbandry sectors.

Development of a Commodity Economy.

Rationalise Settlements. In general the region is near existing railways or highways. What is important is to improve accessibility. Residences far from roads may have to be relocated nearer to transportation facilities.

Four sub-patterns can be used to describe the east-west border area, and specific measures can be identified for developing each sub-region.

The Northern Hebei (Bashang) Plateau Region

The area includes 16 poor counties. The emphases here should be on developing animal husbandry and a comprehensive pastoral economy together with forest protection and conservation.

The Taihang Mountain Region

The poor area includes 41 of 75 counties in the Taihang mountain region. The emphases should be on forestry, horticulture, and water and soil conservation.

The Qinling and Daba Mountain Region

The poor area includes 73 of 87 counties bordering Sichuan, Shaanxi, Hubei, and Henan provinces. The emphasis should be on developing a diversified economy based mainly on mountain resources.

The Wuling Mountain Region

The area has 47 poor counties bordering Sichuan, Hubei, Hunan, and Guizhou provinces. The major nationality groups are the *Tujia*, *Miao*, *Dong*, and *Yao*. Emphasis should be placed on integrated development of forestry and animal husbandry. Tourism also has prospects in this area.

3. The Karst Mountain Areas of Southwest China

The Karst mountainous regions of southwest China are bounded by the Hengduan Mountains to the west, the Jiuwan Great Mountains to the east, the Wumeng Mountains to the north, and the southern Yunnan Mountains to the south. There are 126 impoverished counties in Yunnan, Guizhou, Sichuan, and Guangxi provinces. Broadly speaking, this area covers the Yunnan-Guizhou Plateau and its edges. The population is 39.43 million, of which 50-95 per cent are of minority nationalities.

Plateaux and mountains make up 95 per cent of the land, mostly between 500 and 2,500 metres above sea level, but reaching over 4,000 metres at high elevations. There are numerous small and large upland plains and valleys where much of the arable land is concentrated. Only about 10 per cent of the total land area is cultivated. Altitude variations provide a diversified environment for livestock and agriculture.

The entire area is humid subtropical, with a mean annual precipitation of from 800-2,000mm. Favourable warm winters allow for a long growing period. Two annual harvests of rice and wheat are common, except at the highest elevations. Major crops include rice, rapeseed, peanuts, tobacco, and sugarcane. The cash crops are rubber and coffee.

As one of the three major forest areas in China, this region is an important base for timber and economic trees. China fir, Yunnan pine, tea, orange, tung oil, lacquer trees, shellac, and *mao* bamboo trees are examples. Local products, such as medicinal herbs, are also important, as well as animal products from oxen, hogs, and goats.

Five major rivers (Xijaing, Jinshu, Lancang, Nujiang, and Yuanjiang) descend from the mountains. This area has two thirds of China's total hydro-potential. However, less than two per cent of the waterpower potential has been tapped.

Mineral resources are abundant. The area is a non-ferrous metal region par excellence but also has some ferrous minerals. The area ranks first in copper, lead, zinc, mercury, aluminium, and titanium reserves. The Lanping lead-zinc reserve is among the top ten in the world. The Xinwen-Qingzhen aluminum reserve in Guizhou and the Nandan tin mine in Guangxi are the largest of their types in China. Iron ore, manganese, and phosphorous are other important minerals.

In spite of these resources there are major problems causing poverty in this area and these are summarised below.

A Poor Ecological Environment

The karst topography, sparse vegetation, rocky thin surface soil, and severe soil erosion problems result in a degraded environment.

Isolation and Inaccessibility

Because of huge mountains and deep ravines, the area is secluded. Rail, road; and air transportation are all undeveloped. Few of the rivers are open to navigation. In southern Yunnan alone there are 2,005 impoverished villages, only 47 per cent are connected by roads and 42 per cent have electricity.

Sixty to 70 per cent of villages in the Hengduan mountain area are reachable by road. Only 50 per cent of the administrative villages in northwestern Guangxi are accessible.

Undeveloped Social Structure

These remote areas suffer from low productivity, slash-and-burn cultivation, diversified land ownership, a mixed fishing-hunting-gathering-farming-handicraft-commodity production system, and undeveloped lines of trade. Food from gathering can exceed 50 per cent of a household's food supplies in some areas, and poor families can be short of food for five to eight months a year. Grain yield is only 100-200 *jin* per *mu*.

Farming is the basis of the area's economic structure even though forestry and animal husbandry ought to be emphasised in a mountainous region. Sideline and industrial production are low. Very poor families may own less than 50 *yuan* of property value.

Disease

Many endemic diseases, including leprosy, are prevalent. Household sanitation is a major problem.

In light of the abundant resources and some favourable climatic conditions mentioned earlier, we have listed some of the possible measures for developing this area.

Water and Soil Management. In accordance with the karst area characteristics, measures to prevent irrigation leakages and to retain rain water are needed. Building small and medium-sized reservoirs and dams that are integrated with small power stations, developing spray irrigation, and generating electricity are recommended.

Change in Land Use. The area is most suitable for forestry and animal husbandry. Steep slopes which have been cultivated should be returned to forest and grassland, and forest destruction through land reclamation should be stopped. Lowland hills should develop economic trees such as orange, tea, tung oil, lacquer, and shellac trees. Low valleys should emphasise grain and economic crops. Sideline production and industrial activities need to be developed as well.

Advanced Education and Technology. The unity and equality of nationalities should be strengthened, scientific and technological education advanced, and funds provided for development. Gradually old ideas and customs may be replaced by more modern ones.

Five sub-patterns can be recognised in this region.

The Wumeng Mountain Region

The area includes 36 impoverished counties on the borders of Yunnan, Guizhou, and Sichuan provinces which are inhabited by the *Han*, *Yi*, *Miao*, *Buyi*, *Hui*, and *Shui* minority nationalities. Topography and climate are varied. Seventy per cent of the area is karst mountain or plateaux. There are abundant land resources and well-developed animal husbandry, but drought and water shortage, as well as serious soil erosion, are the real problems in the mountains. Emphasis should be in developing "three-dimensional agriculture", using the advantages of a varied mountain terrain and the integrated development of farming, forestry, and animal husbandry. The scope for developing economic trees, medicinal herbs, and special local products is immense.

The Jiuwan Mountain Region

The area includes 17 impoverished counties on the border of Guizhou and Guangxi provinces. The *Miao* (the majority group), *Zhaang*, *Han*, *Yao*, and *Jingpuo* nationalities live here. Emphasis should be on developing forestry, especially economic trees such as tea oil, tung-oil, China fir, and pine. Integrated development of forestry, farming, and animal husbandry can be the basis for a diversified economy.

The Northwestern Guangxi Mountain Region

The area covers 41 impoverished counties located in the transitional area between the Yunnan-Guizhou Plateau and the Guangxi Basin. The *Zhuang* (the major group), *Yao*, and *Han* nationalities live here. With self-sufficiency, or surplus grain production, as the basic goal, the area should receive emphasis in developing forestry, horticulture, economic crops, and special local products.

The Southern Yunnan Region

The area includes 19 impoverished counties, mainly inhabited by over 20 minority nationality groups. With self-sufficiency in grain as the basic goal, cultivation of tropical crops such as rubber, coffee, bananas, and pineapple; raising the production level of forestry; and animal husbandry should be emphasised.

The Hengduan Mountain Region

The area includes 13 impoverished counties in the middle and southern Hengduan Mountains in western Yunnan, inhabited largely by minority nationalities some of whom are Tibetans, *Yi*, *Nu*, *Dulong*, or *Lisu*. The emphases for development should be on increasing self-sufficiency in grain production; rationally exploiting forest and grassland resources; and raising production of forest, animal, and local products such as medicinal herbs.

4. The Hills and Mountains in Eastern China

This area occupies 162 poor counties, most of which are old revolutionary bases. It is bounded by the Huanghe River in the north and the Beijing-Guangzhou railway in the west. The region covers the Yimeng Mountains in middle and southern Shandong, the Dabie Mountains along the border of the Hubei, Henan, and Anhui provinces, the Jinggang Mountains on the border of the Hunan and Jiangxi provinces, the Wuyi Mountains on the border of the Jiangxi, Fujian, and Guangdong provinces, and some of the mountain areas on the southeast coast in Fujian and Guangdong.

The southeast monsoon climate is typical of the area. Winters are cold and dry. In general the climate is favourable for agricultural production. There is abundant groundwater (average flow depth 200-1,200mm), acidic soil, and predominantly forest flora. Except for the Yimeng Mountains, the annual temperature is around 15-20°C and the mean annual precipitation range is from 1,000-2,000mm. The generally mountainous terrain is characterised by elevations from 500-1,000 metres above sea level -- the highest peak of the Luoxiao mountains reaches 2,120 metres.

There are regional variations in climatic conditions. Farming is intensive, since there are very limited flat areas. The per capita arable land is about one *mu*. Arable land, mainly paddy land, makes up 15-20 per cent of the total area.

The area is a major supplier of coal, copper, aluminum, zinc, tungsten, and molybdenum for China. It is an important forest area in China as well, with tropical rain forest; subtropical, broadleaved evergreen forest; pine-fir needle-leaved forest; and warm temperate, broadleaved deciduous forest. It is rich in economic trees and special local products such as tea, tea-oil, orange, *mao* bamboo, bamboo shoots, and a variety of medicinal herbs.

Major problems to be overcome include the following.

Climatic Conditions

Drought, flooding, waterlogging, and low temperatures with continuous rainfall affect local agriculture. There is an 80 per cent probability of drought. There is a northern spring drought, a central summer-autumn drought, and a southern winter-spring drought. Waterlogging occurs on average once every two or three years. This unfavourable situation is most serious in the coastal mountain and hill regions of the Fujian and Guangdong provinces where typhoons are frequent from February to April, causing stem rot or death of sprouts.

Poor Soil

The soil is low in organic matter with some clay accumulation and a low base supply, leading to low and unstable crop yields. The red soil in the Jiangnan hills is an example of this.

Inappropriate Use of Resources

Some resources have been seriously reduced because of irrational exploitation. For instance, while concentrating on farming, forests have been felled in order to extend agricultural land. Consequently soil erosion is a big problem.

In light of the above conditions, the emphasis in development should be on the following.

Lay Stress on Both Farming and Forestry. Farming should be developed along with forestry, animal husbandry, sideline production, fisheries, mining, and other industries. Self-sufficiency or partial self-sufficiency in grain should be accomplished along with diversification of the economy.

Manage Rivers, Mountains, and Fields Comprehensively. Firstly, trees should be planted widely, for timber and for water conservation, in remote mountain regions. Secondly, fields should be terraced to control soil erosion. Thirdly, a major project should be developed to expand irrigated land. Fourthly, poor red soil should be improved with fertiliser and green manure crops. Fifthly, a proper system of crop rotation must be observed.

Establish Commodity Production Bases. Specialisations in commodity production, according to local resources, should be promoted. Timber production bases should be located in regions such as the Wuyi Mountains bordering the Fujian, Jiangxi, and Guangdong provinces and the southern Jiangxi Mountains. Tea production bases can be established in the well-known traditional tea growing areas. Orange production bases can be in the southern Jiangxi and eastern Guangdong Mountains which have long planted orange trees. Other possible production bases could be tea oil, *mao* bamboo, bamboo shoots, and medicinal herbs.

Develop Mountain Transportation. A commodity economy cannot develop without an adequate transportation system. Services, as well as transportation, need to be well developed. These will also help in the growth of tourism.

The hills and mountains of eastern China can be divided into four sub-regions.

The Yimeng Mountain Region

The area includes 14 impoverished counties (which are also old revolutionary bases) out of 20 in the region. Development efforts here should concentrate on forestry and water and soil conservation; and in developing a diversified economy.

The Dabie Mountain Region

The area includes 44 impoverished counties. Emphases for development should be on utilising and conserving mountain resources, controlling soil erosion, and developing forestry.

The Hill and Mountain Regions in Hunan and Jiangxi

The area includes 59 impoverished counties out of 68, located in the red soil hills of Hunan and Jiangxi. Most are old revolutionary bases. These areas have significant development potentials. The development emphasis should focus on comprehensive management of red hills, improving yields, and developing forestry and economic crops.

The Hill and Mountain Regions in Fujian and Guangdong

The area includes 49 impoverished counties in the coastal southeastern mountains of China. Integrated forestry and farming and horticulture need to be promoted.

5. The Qinghai-Tibetan Plateau

The Qinghai-Tibetan Plateau is the "roof of the world" and encompasses a vast area and high terrain. It covers all of Tibet, most of Qinghai, and some parts of Sichuan, Gansu, and Yunnan. There are 96 impoverished counties -- 77 in Tibet and 19 in Qinghai.

Characteristics of the Region

The region is characterised by a harsh ecological environment and frigid climate, as well as insular location from the more developed coastal China. This gargantuan plateau is composed of a series of imposing mountains ranging from 3,000-6,000 metres above sea level (covering more than 90 per cent of the area), table lands of from 3,000-5,500 metres, and numerous basins and valleys.

Suitability for Animal Husbandry

Where elevations are above 4,500 metres, the average temperature in the hottest month is only 3°-6°C. There is no human habitation above 5,000 metres. In the high regions there is no frost-free period, making conditions difficult for crop maturation. Therefore these areas are only suitable for animal husbandry. However, the plateau is well known for its abundant energy and an intense solar radiation of 60-70 per cent. The daily temperature range is from 14-16°C.

Vast grasslands account for 60 per cent of the area. Excellent grassland exists on the eastern plateau and in the southeastern semi-humid areas. In the northwest there are semi-arid prairie grasslands and arid desert. The forest area of the southeast and southern plateau region is the second largest in China.

Yak, Tibetan sheep, and goats are the three main livestock species. Highland barley, oats, wheat, potatoes, and other cold-resistant crops are grown. The dominant trees are dragon spruce and fir.

Population Characteristics

Sixty-five per cent of the total population are Tibetans. Other nationalities are the *Han*, *Hui*, *Meng*, and *Sala*. Though the area has had increasing contact with mainland China, it remains isolated and backwards in many respects. Fifty to sixty per cent of the population are illiterate. Energy resources have not been sufficiently developed.

According to the conditions stated above, major management efforts should be concentrated on the following areas.

Emphasise Animal Husbandry. Natural and man-made grasslands should be utilised to develop yak, Tibetan sheep, and goat livestock production. Special attention should be paid not to disrupt the ecological balance.

Plan Forest Exploitation and Utilisation. Priority should be given to lumbering mature trees, fir trees in the hills, and protecting water in the valleys.

Construct High and Stable Yield Farmland. Valleys and stream areas should be taken advantage of fully and grain self-sufficiency should be raised.

Make Use of Solar and Geothermal Energy.

Develop Local Mining.

Enhance Literacy, Education, and Skill Training.

Two sub-regions can be identified in the Qinghai-Tibetan Plateau region.

The High-Altitude Mountain Region in Tibet

The area includes all of Tibet. Emphases should be on developing animal husbandry, forestry and local industry, and family sideline production, in addition to striving for self-sufficiency in grain production.

The Qinghai Plateau Region

The area includes 37 counties in Qinghai Province, 19 of which are impoverished. Emphases should be on developing animal husbandry, utilising natural grassland; combining farming with forestry and animal husbandry; and improving agricultural production in the valleys.

6. The Meng-Xin Arid Area

This area is composed of the Inner Mongolia Plateau and the Xinjiang Basin, with 48 impoverished counties in southeastern Inner Mongolia and 27 in western Xinjiang. The natural and economic features are similar throughout the general area.

Characteristics of the Region

The region is abundant in energy, land, and mineral resources. High summer temperatures and wide daily temperature ranges are characteristic of the region and are favourable for good harvests under well-irrigated conditions. Mineral resources include coal, oil, copper, plaster, stone, and limestone.

The main problems relate to sparse, uneven rainfall and consequent drought, lack of forests and trees, frequent sandstorms, and poor maintenance of fields.

Considering the above problems, attention should be given to the following areas.

Rationally Exploiting and Using Water Resources. Rational exploitation includes digging for underground water, blocking groundwater, and transferring melted snow to drinking water supplies. Industrial use and irrigation use also need to be managed.

Developing and Protecting Grassland. Man-made grassland can be developed (sowing by plane) and existing grassland can be protected, recovered, or improved. Over-grazing should be prevented.

Recovering Farmland. Soil improvement is needed as well as capital construction for farming.

Developing Forests. Conservation forests for sandstorm prevention or water conservation should be established. Economic and fruit trees should be planted. Ecological improvement activities can also enhance income.

Developing a Diversified Economy, Local Industry, and Mining. Township industry and family sideline production can focus on special local products such as processed animal products or minority nationality handicrafts and traditional items.

Enhancing Scientific and Technological Exchanges. To support hinterland-heartland exchanges in science, technology, and local talent, special policies should be adopted to absorb costs, etc.
The Meng-Xin Arid Area can be divided into two sub-regions.

The Sandy Region on the Southeastern Edges of the Inner Mongolian Plateau

The area has 51 impoverished counties and includes the Nuluerhu Mountains, one of the 18 poverty regions identified by the Central Government. Emphasis for development should be on promoting animal husbandry, combined with farming.

The Arid Region in Western Xinjiang

The area has 27 impoverished counties with a semi-desert grassland and oasis economy. Development should emphasise farming, combined with horticulture, forestry, and animal husbandry. Creation of shelter forests should be a priority activity in this sub-region.

Section B

Poverty: Development Policy and Strategy

CHINA'S ANTI-POVERTY PROGRAMMES: WHERE SHOULD THE FOCUS BE?

Xiang Nan

There are, in today's China, eighteen regions, where the people are yet to rise above the lowest standard of subsistence. Two of these, the Yimeng and Fujian-Guangdong mountain regions in east China, are in the coastal region. They are easily accessible and densely populated areas with favourable natural conditions. With these advantages these two regions are likely to rid themselves of poverty in the near future.

Of the remaining 16 regions, five regions in central China were historically revolutionary bases. They include southern Jiangxi Province and the mountain regions of Nuluerhu, Taihang, Luliang, Dabie, and Jingang. Much has been achieved in helping the poor in these areas.

The remaining eleven regions in northwest and southwest China include north Shaanxi, Xihaigu, and Dingxi; the Daba mountain region of the Qinling mountain range; the mountain regions of Wuling, Jiuwan, and Wumeng; the north-south extension mountain region; southeast Yunnan Province; northwest Guangxi Province; Qinghai; and Tibet. With mostly arid land; harsh natural conditions, including high elevations and a cold climate; high incidence of endemic disease; inaccessibility; and an extremely backward economy, these regions present formidable obstacles to development. For these regions poverty alleviation will require long-term and comprehensive strategies of systematic reforms of government, economy, culture, public health, and demography.

There has been an emphasis on economic construction during the process of reform and opening-up in coastal China in the east in the past ten years. Most of the funds and technology from abroad have been funnelled to the regions and cities in that part of the country. This has widened the gap in economic development between east and west. The focus of anti-poverty programmes in China has therefore been to move to the western and central-western regions.

The shift will mean increased funds, better human resources, and stronger leadership. The birthrates in some of the under-developed areas in west China, which are 50 to 100 per cent higher than the national average, are a serious problem. The rapid population increase there will eventually result in a vicious cycle of "the lower the living standard, the higher the birthrate, and the higher the birthrate, the lower the living standard". Birth control in these regions, therefore, should be made more effective.

The financial assistance provided by the government for these regions for development in the form of free aid and low or discount interest loans amounts to as much as nearly four billion *yuan* a year. Putting this amount of money to effective use is a matter of great concern. Practices prevalent in some places, such as diverting money from legitimate outlets so that "everyone gets a bit of it", making it available to members of the

government to the exclusion of the people, or to the rich instead of the needy, must be stopped so that the impossible situation in which aid can only "keep the poor forever poor" will be brought to an end.

The anti-poverty programmes in these regions should also emphasise the role of science and technology in eliminating poverty. Also, the programmes for these regions should not be limited to purely economic purposes; but should be more comprehensive - including development of vocational education, training of personnel, and the selection of competent government officials.

Western China has great potential and is full of promise. Rich in metal and energy resources, this area extends over approximately 70 per cent of the country's territory and is inhabited by less than 30 per cent of the nation's population. A fledgling "third line" network of basic industries has emerged there, thanks to the enormous efforts made in the 1960s. Therefore, the focus of anti-poverty programmes should go beyond aid and help build the economy for a developed west which will benefit east and central China as well.

TWO ISSUES INFLUENCING THE CURRENT DEVELOPMENT OF POOR MOUNTAIN AREAS IN CHINA

Shi Shan

In order to develop the poor mountain areas in China effectively, there are two issues that need attention. One is the perception of poor mountain areas, i.e., are the poor mountain areas in China burdens or potentially tremendous production bases? and the other is the issue of development strategy, i.e., whether individual development should be promoted to get rid of poverty or whether planned comprehensive development should be attempted from the very beginning? These two issues are closely linked and inseparable.

With regard to the first issue, the poor mountain areas of our country are potentially tremendous production bases. However, these areas have been thought of as burdens for a long period of time. This view is not only held by leaders at the lower levels but also by those at higher levels. One conclusion drawn in the book entitled 'Economic Growth in the Remote Areas of China' (published by the People's Press in 1990) was that, *"during the 35 years from 1952 to 1987, the economic growth rate in the remote areas was far behind that of the national level"* with a growth rate of 1.8 per cent for the former and of 4.8 per cent for the latter. Remote areas were regarded as survival zones. There was a striking contrast between the miserly attitude when allocating growth resources and the generous attitude when allocating survival resources in these areas. *"The basic policies of the central and provincial governments are to meet the minimal survival demand and give insufficient attention to the issues of industrialisation and traditional agricultural reform in these areas"* (p.157). This attitude is reflected in the perceptions of local government and also in those of the cadres. The predominant perception has been that remote mountain areas are "burdens" to the national economy.

Are the poor mountain areas really survival zones ? What is the basis for regarding poor mountain areas as potential production bases ? There are seven aspects that contribute to the productive potentials in mountain areas.

1. According to the investigation by agricultural division departments in 1983, there is a total of 1.17 billion *mu* of mountain wasteland that can be devoted to forestry, 720 million *mu* of mountain range, or hillside grassland, and 3.37 billion *mu* of utilisable grassland in north China. The mountain areas in south China have superior conditions and it is considered to be a land of treasures.

2. Mountain areas can produce large quantities of xylophyta food and oil, such as chestnuts, dates, persimmons, gingko, walnuts, oil-tea camellia, Chinese prickly ash, shiny-leaved yellowhorn (*Xanthoceras sorbifolia*), etc. There are more than 400 species of xylophyta food trees, and more than 100 species of xylophyta oil trees. All of them are superior products with high nutritional values. Once people's living standards begin to improve, the demand for such products will be greater both at home and abroad. The establishment of such production bases in

mountain areas can also reduce the pressure on agricultural zones, meet the demands of cities, and earn foreign exchange via export.

3. Mountain areas can become the basis for silk production through mulberry plantation and raising silkworms on a large scale. Planting mulberry will not only afforest the mountain areas but also produce firewood, and the bark of the mulberry can serve as raw material for high-quality paper-making. The total production of silkworm cocoons in 1990 reached 440,000 tonnes, which is only 10.4 per cent of the total cotton production. Nineteen ninety was a bumper harvest year for cocoons, yet production was still too low. The production of cocoons in the Sichuan, Jiangsu, and Zhejiang provinces accounted for 80.1 per cent of total production. There is great production potential in all the mountain areas. Before the Tang Dynasty (A.D.618-907), China did not produce cotton and clothing was made of silk, flax, and hemp. Therefore it is short-sighted to produce silk only for foreign markets. The main market, in fact, is domestic.

4. The mountain ranges in south China have four times the area of pasture of New Zealand, with fairly similar natural conditions. If these ranges are used properly, large quantities of beef, mutton, milk, fur, and wool can be produced. The grasslands in north China have a lot of potential. China has limited arable land. In order to increase meat production, the main measure should be to develop grassland animal production. This will not only enrich the mountain and pastoral areas, but also alleviate the pressure on agricultural areas.

5. It is noted in the book, entitled "Contemporary Forestry in China", that there are about 450 species of wild animals, 1,186 species of wild birds, and 516 species of amphibians and reptiles. There are about 120 species of wild animals and 150 species of wild birds of important economic value. Making use of and raising wildlife are among the new endeavours undertaken. Many specialised households raise snakes, bears, mink, giant salamanders, pheasants, soft-shelled turtles, and scorpions. Experiments in wildlife husbandry could provide the basis for rational use of wildlife resources.

6. The traditional native products of mountain areas, such as fruits, tea, bamboo shoots, medicinal herbs, various industrial raw materials, various kinds of perfume crops, have considerable economic value. This is especially true for Chinese medicinal herbs which are in great demand in foreign countries.

7. The greatest feature of products produced in mountain areas is that they are pollution free. Mountain areas should make full use of this feature and protect it. Attention should be paid to avoiding the introduction of polluting industries.

Mountain areas were regarded as burdens in the past because of "paying attention to nothing except foodgrains." Because of the shortage of arable land with few possibilities for land expansion, mountain farmers cannot be self-sufficient in good grain. The emphasis on food self-sufficiency has led to reclamation of land by destroying the forests, resulting in soil erosion and increased occurrence of natural calamities such as drought and flood. In addition, the State had to allocate large sums of relief money for the poor people.

At present, due to the increasing pressure of population in China, it is essential to open up new production domains in order to feed a huge population in China. Due to the development of a commercial economy and an increase in people's living standards, the demand for many native mountain products, such as fruits, chestnuts, walnuts, gingko, dates, bamboo shoots, medicinal herbs, etc., is increasing. This has widened people's vision and created favourable conditions for recognition of the potential of mountain areas.

The second issue concerns the strategy for development of poor mountain areas. The emphasis here should be on promoting planned economic development because poor mountain areas are complicated systems *per se*. If there are no conscientious investigations and no systematic planning, there will be no correct measures, let alone active achievements. There are several lessons in this regard. There are also successful models, i.e., the practical experience gained by a group of counties which conducted experiments in ecological agriculture. These counties organised technical staff to formulate an integrated development plan for social, economic, and ecological development; undertook development and construction in a planned manner by coordinating manpower, funds, and materials from various sectors; combined development production and construction in feasible ways; integrated the development of agriculture with the development of township enterprises; and coordinated various rural construction programmes. Under the same conditions of investment, manpower, and fund input, they have achieved significant results. There are examples of county leaders actively implementing the same development plans for three to four terms, and the achievements have been very significant. Cadres and the masses have provided full support during the whole process of implementation.

Is it difficult to undertake countywide comprehensive systematic planning for development and construction? Can it be extended to poor mountain areas? There are favourable conditions for such undertakings. Firstly, the work of agricultural divisions/departments has been carried out in each county. Secondly, the governments have been involved in helping poor mountain areas through specialised institutions and specialised funds. Thirdly, governments at various levels have organised efforts to help the poor mountain areas improve their economy. Fourthly, the Agricultural Systems' Engineering Committee of the Chinese Association of Systems' Engineering has helped more than 400 counties in the formulation of development plans in the past two decades, trained a group of specialised technical staff, and published a series of books on this subject which have provided manpower and training materials for large-scale undertakings of such integrated development plans. Many counties have accumulated rich experience. Longyan Prefecture, Fujian Province, which belongs to one of the 18 poor mountain regions, provides an example in formulating integrated development plans for the whole prefecture, as well as for every county and city in the prefecture.

The issue of poverty in mountain areas is basically an issue that has persisted because of the lack of recognition of the potential of mountain areas. Policy changes, the need to open up new production bases, the rich experience of the past, and a number of successful examples provide a favourable environment in dealing with the poverty issue in the mountains of China.

ECONOMIC DEVELOPMENT IN POOR MOUNTAIN AREAS OF CHINA: ON POLICY STRATEGY

Ai Yunhang

1. The Strategic Significance of Accelerating Economic Development in Mountainous Areas

Since 1979, profound and historical changes have taken place in rural China, the rural economy has developed rapidly, and farmers' living standards have distinctly improved. But, due to differences in resource bases, as well as historical and ideological reasons, economic development in different areas is uneven. Most of the poor areas are located in the mountains. These are also old revolutionary bases and areas where ethnic nationalities live. Development of poor mountainous areas is both an economic and social issue. Economic development in poor mountainous areas has to be hastened to take advantage of their rich natural resources and to realise the four modernisation goals (agriculture, industry, national defence, science and technology).

2. Features of Poor Mountainous Regions

The features of the 18 poor regions in China are as follows.

Abundant and Diverse Natural Resources but Lack of Rational Exploitation

The poor mountainous areas occupy a vast territory and have rich land resources, but the proportion of cultivated land is limited, soil quality is poor, soil erosion is a serious problem, yields are low and uneven, and there are grain shortages.

There are also diverse biological resources; most of the 30,000 plant species and more than 1,800 terrestrial vertebrates of China can be found in these poor mountainous areas. These provide better conditions for the overall development of agriculture, forestry, livestock, fisheries, industries, and a variety of sideline activities. Historically, these plant and animal resources have not been used properly and forest resources have been over-exploited. There are more than 30 proven mineral reserves, above 20 rare metals, and more than 60 non-metallic minerals. Owing to the scarcity of capital and qualified personnel and inadequate technology and infrastructure, the mineral resources in these areas have not been used rationally.

Mountain Areas are Mostly Inhabited by Several Minority Nationalities with Diversified Economic Systems

Among the 18 poor mountainous regions, 12 regions have minority nationalities, with five minority nationality autonomous regions, 24 autonomous prefectures, and 44 autonomous counties. There are 55 minority nationalities in the whole nation, of whom over 90 per

cent live in poor mountainous areas. Besides, there are many different economic systems in poor mountainous areas, varying among the minority nationalities.

These areas are also characterised by poor infrastructure, underdeveloped economies, and financial crises resulting from low revenues and dependence on State subsidies.

Low Levels of Education and High Population Growth

In spite of the work carried out to develop culture, education, and sanitation and to introduce science and technology, mountain areas still lag far behind. The level of education is low and in many areas the population growth rate is much too high. Poor sanitation and endemic diseases contribute to high mortality rates.

3. State Support to Poor Mountain Areas

Since 1979, the Government has been extremely concerned about development in poor mountainous areas, and a series of supporting measures has been undertaken.

Liberal Policies

The main features of these liberal policies are given below.

i) Minority nationalities can themselves select the optimum management method for their productive activities.

ii) The contract period for cultivated land can be extended to 30 years, and the rights of contracting can be transferred.

iii) Livestock can be priced and owned by farm households, private raising and private ownership are permitted, and livestock can be butchered and put on sale by the raisers themselves.

iv) The contract responsibility system has also been extended to pastures and slope lands. Mountainous areas and open forests owned by collectives can be contracted out to private ownership and operated by households who can plant the trees and own the timber. Forestry farms and share-holder forestry cooperatives can be established. Shareholders can receive profits according to the number of shares they own, and the responsibility system is linked with remuneration.

v) Enterprises and other units (State farms, State pastoral farms, reservoirs, hydropower stations, and other factories) established by the State are required to provide and share the profits with minority nationalities. Mountain farms and water and mineral resources that the State enterprises do not have the ability to operate can be contracted out to farmers. Employment of locals should be given priority.

vi) Participation of minority nationalities and local communities in the development of local resources is encouraged.

vii) There is a policy that discourages cereal crop cultivation on slopes of above 25 degrees. The idea is to revert these lands to forests or bring them under tree crops.

Reduction of the Burden through Favourable Policies

In recent years, the State has introduced special policies to alleviate poverty and promote development in these areas.

i) Since 1985, in poor mountainous areas, agricultural tax has either been reduced or exemptions have been given; in the poorest areas or most difficult areas, exemptions from taxes can be given for five years, and, in other disadvantaged areas, they can be reduced for a period of from one to three years.

ii) Prospective enterprises (forestry farms, livestock farms, hydroelectric stations, mining, and other factories) can receive income tax exemptions for five years.

iii) Agricultural, forestry, livestock, sideline, and other native products can be sold or bought freely.

In addition, supply and marketing cooperatives have to act as agents for purchasing agricultural products and selling basic goods. Relief for poor areas should be tied to development work such as construction of roads, irrigation channels, drinking water schemes, etc.

Rational Use of Interest-subsidised Loans

Leadership under the State Council for Economic Development in Poor Areas is to be strengthened. In order to use the interest-subsidised loans provided to support poor counties, the following measures are necessary.

i) The abundant natural resources in poor areas should be used to start productive activities and develop a commodity economy.

ii) The policy for equal division of funds to each area needs to be reviewed. Funds should be used for concrete programmes.

iii) Emphasis should be given to providing large-scale technical training and inputs (technology, information management and funds, and goods) for farmers and cadres according to the specific programme needs.

iv) Attempts should be made to integrate the development of poor regions and developed areas through mobilising capital and technology from the latter and labour from the former.

Bringing economic development to mountain areas is an arduous task, particularly in southwest and northwest China where minority ethnic groups live. But it is through such efforts that the economic development of poor areas can become part of the national, long-term economic development programme.

4. Policy Measures for Future Economic Development in Poor Mountainous Areas

Improving Self-sufficiency in Grain and Diversifying the Economy

Without sufficient grain, farmers cannot feed themselves, let alone develop mountain areas. One reason why forests and grasslands are destroyed is the short supply of grains. Grain production can be increased through better management of irrigated land, flatlands, and terraced fields. In places where irrigation is good, the concentration should be on increasing yields. In places where there is no irrigation, technologies to retain soil water and moisture and increase the organic manure input in order to improve the yields per *mu* should be encouraged. Intercropping of trees and grass can be encouraged. In certain places, livestock can be raised. The focus should be on the exchange of specialties and local products from the forests, livestock industry, and herbs and on producing grain in the plains.

To diversify the economy there should be equal stress on the use and protection of varied resources in mountainous areas. In forestry, for example, the emphasis should on integrated development of timber forests, commercial forests, fuel forests, water source forests, and shelter forests, paying special attention to the growth of products such as fast-growing trees, fresh and reserved fruit, xylophyta grain, edible oil, tea, mulberries, crude drugs, etc which can produce benefits quickly. Township enterprises and other family and sideline activities should be developed positively. Jointly-managed processing industries for food, feed, and medicinal materials should be introduced and expanded. The State and local governments should promote the construction of infrastructure to support development in mountainous areas.

Developing a Commodity Economy and Intensifying the Socialised Service System

The main objective of economic development in poor mountainous areas is to use the resource advantages to develop a commodity economy.

In order to organise thousands of households to develop commodity production, we must mobilise the markets and make the service system efficient. The Supply and Marketing Cooperative of China and service organisations, in sectors such as agriculture and forestry, water conservation, livestock industry, farm machinery, science and technology, should be made active in order to provide good services for pre-production, production, and post-production activities.

Manpower Development

From a long-term point of view, an important outlet for improving the quality of labour in poor mountainous areas is to develop education. Large-scale technical training for

farmers, particularly for school leavers in villages, should be developed and adapted to suit local conditions.

Achievements in science and technology made in other places have to be brought to bear to improve the production level and earn more profits.

Strengthening Horizontal Links and Opening up to the Outside World

In order to reap the benefits of resource advantages in mountainous areas, economic links with the outside world have to be strengthened. This means opening up to an outside world which includes the cities, prefectures, and provinces inside China. Only in this way can the capital, human resources, technologies, and experiences, both at home and abroad, be introduced. Joint ventures should be encouraged. Measures should be taken to attract technical personnel or enterprises from other cities, prefectures, and provinces to establish productive enterprises in mountain areas. The leaders should visit coastal areas to learn from others, widen their views, accumulate knowledge, and improve the capability for developing a commodity economy. State-run factories and mines, located in poor mountainous areas, should provide technological support to help the population develop township enterprises and local industries.

In order to improve the efficiency of fund utilisation, a competitive mechanism should be introduced.

Strengthening the Leadership for Economic Development at Local Levels in Poor Mountainous Areas

The leadership at county level is the key to developing the economy at the provincial or prefectural levels. Qualified leaders should be chosen and offices and institutions for economic development strengthened. Leaders who make significant achievements in economic development should be recognised by the State. The idea of the integrated development of various sectors should be reinforced.

Family planning policies should be implemented conscientiously by encouraging late marriage and promoting smaller families. Population growth should be strictly controlled. Medical and hygienic conditions in poor mountainous areas have to be improved, particularly with regard to the prevention of endemic diseases, epidemic diseases, and infectious diseases. Priority should be given to training medical workers.

THE NEED FOR A SPECIAL ECONOMIC POLICY FOR THE DEVELOPMENT OF THE POOR DISTRICTS IN CHINA

Yan Ruizheng

1. An Evaluation of the Present Economic Policy for the Development of Poor Districts

Since 1978, when China started its economic reforms, the speed of rural development has been high. However, poor districts have made very slow progress. As a result the difference between poor districts and developed districts in rural areas has widened. The State Council established a specific leading group for the economic development of poor districts to strengthen the leadership and the provision of aid in these areas. Since then, a series of measures has been put into operation.

Firstly, a more privileged policy was adopted for the poor districts. Under the condition that the main ownership be socialistic, peasants can select their preferred management systems. The contracts for land management in poor districts can be up to a period of 30 years compared to fifteen years in developed rural areas. The grasslands and shrublands in the hills and mountains can be contracted out to peasants on a long-term basis. Mountain land, water, and mineral resources owned by State enterprises can also be contracted out to peasants. Mineral resources in poor districts can be exploited by the peasants through collectives. Cropping is prohibited on cultivated lands having slopes of more than 25 degrees. These can be afforested by peasants who can own and inherit them as properties.

Secondly, the government has allocated special funds for resource exploitation in poor districts. From 1986 to 1990, the government allocated an additional one billion *yuan* on top of the original 3.8 billion *yuan* for economic promotion in poor districts. Specific funds were also allocated for animal husbandry and local industry. These funds supported technical and material investments in poor districts and benefitted forty million people.

Thirdly, the government tried to lighten the burden on poor districts by reducing or remitting taxes. The commerce department sold a suitable amount of cloth and cotton on credit to the poorest districts where the peasants even lacked the clothes to maintain themselves in the bitter winter cold. It also organised the peasants in poor districts to construct small-scale irrigation systems and transportation lines, using government grain stocks and cloth as investments. In addition, special allocations were made to improve energy facilities and water conditions for several million people.

Fourthly, the government tried to improve education in poor districts and wipe out illiteracy. Primary education had been made universal in these districts. Education in poor districts emphasises professional education in agriculture and adult education for expert training in order to meet the needs of economic development. The National Committee for Science and Technology of the State Council has also organised a nationwide project, the SPARK Project, to achieve technical progress in poor districts. A

model, which was developed in the Taihang mountain districts in Shanxi Province by SPARK, was popularised in all the poor districts of the nation known as "Taihang Ways to Progress".

Finally, economic development in poor districts was integrated with the development planning of the national economy. It laid stress on both improvement in present living conditions (enough grain to eat and clothes to wear) and long-term development of the regional economy. The government organised its department and mobilised various non-government organisations to aid the poor districts. These social organisations took charge of a specific county or a village and helped in the alleviation of poverty.

These efforts have paid some dividends. The impoverished population decreased to 5.3 per cent of the national population in 1988 compared to 12.2 per cent in 1985.

However, there are still serious problems which need urgent attention in these poor districts.

1. The conditions in poor districts still need much improvement. The people in these districts consume only 85.5 per cent of the standard amount of daily calories and 67.1 per cent of the standard amount of daily proteins. Impoverishment and malnutrition are common.

2. The figures on the impoverished population mentioned above were calculated without considering price changes and inflation. The actual population below the poverty line far exceeds this figure.

3. In terms of economic development the gap between poor districts and developed districts has become wider and is increasing.

2. Economic Problems in Poor Districts

Poor districts are economically disadvantaged in the following ways.

1. With the same amount of investment as in developed districts, poor districts receive fewer products, because of poor infrastructure. In other words the returns on investment are low.

2. Transportation costs are high and the prices of production and materials for consumption are also high. Therefore, the same investments as in developed districts result in lower profits in poor districts. For example, the average prices of salt, kerosene, and coal are 0.31, 0.71, and 0.042 RMB *yuan*/kg respectively throughout most of China, whereas they are about 1-2.8, 2-3.2, and 0.06-0.066 RMB *yuan*/kg respectively in poor districts.

3. Because of advantageous investment conditions and advanced technology, developed districts can adopt intensive farming and can still obtain high profits. The poor districts, in contrast, can hardly obtain average profits because of undeveloped management and inefficiency in investment.

4. The burden of environmental deterioration, which was a toll exacted during development of the national economy, was transferred to the people in poor districts. The cost of environmental improvement, such as afforestation, water and soil and vegetation conservation, is surprisingly high. Environmental improvement efforts benefit mainly agriculture and industry in the plains. These efforts help maintain a smooth transportation network, reduce natural hazards, and provide raw materials for the national economy. Because of the high costs of construction and long period of returns on investment, poor districts carry the burden for environmental conservation, but the benefit of their efforts goes to developed districts. The four aspects mentioned above result in poverty, low economic efficiency, and slow development of poor districts. In 1988, we investigated Zhanhuang County, a poor county in the Taihang Mountains in Hebei Province, and Zhending County, a developed county near Zhanhuang County in the same province. A comparison of the economic efficiency of specific crop plantations in the two counties is given in Table 1. The comparison of wheat and maize crops in Zhanhuang and Zhending counties shows that the cost is low and productivity high in the developed district.

Table 1: A Comparison of the Economic Efficiency of Wheat and Maize Plantation in Zhanhuang and Zhending Counties

Project	Wheat		Maize	
	Zhanhuang	Zhending	Zhanhuang	Zhending
Productivity (kg/ha)	3171.50	4518.80	4574.20	6335.50
Cost (RMB Yuan/50 kg)	30.20	22.90	15.90	12.00
Profit (RMB Yuan/ha)	418.40	1063.40	774.90	1287.80
Cost/profit	0.44	1.08	1.06	1.60
Income (RMB/work hour)	2.48	6.18	4.25	6.66

Therefore, development in poor mountain areas should not be perceived as charity or aid but as a means of repaying for the environmental toll exacted by developed districts. This is why poor districts need a special preferential policy to prompt economic progress.

3. Specific Economic Policy for Poor Districts

Among all the measures for aiding poor districts, the most effective measure is to reform the political and economic system and establish a free market economy.

The present preferential policies of the government for poor districts need urgent revision.

1. The present system under the government planning framework in which funds are provided to purchase farm produce and side products is advantageous to developed districts but disadvantageous to poor districts.

Poor districts have abundant native products, but lack the kinds of farm products which are included in government plans. Poor mountain districts normally produce no, or little, marketable grain. The government policy provides fertilisers, pesticides, and gasoline for districts which can produce marketable grain, in order to encourage crop farming in those areas. Poor mountain districts, therefore, cannot receive government-allocated fertilisers, pesticides, and gasoline and are forced to purchase them at high prices in the market. This adversely affects the economy of poor districts.

Considering these problems, the Government should rescind the policy for allocating production materials such as fertilisers, pesticides, and gasoline in proportion to the planned amount of marketable grain. In addition, in order to pursue the highest economic efficiency, a differential price system for the allocation of production material should be practised throughout the nation. The Government should reduce the selling prices of production materials for poor mountain districts and raise them for developed districts.

2. Special funds should be established for nature conservation and environmental construction in mountain areas. The conservation fund can be collected by raising the water price in the plains to support afforestation and natural conservation. The environmental construction fund can be collected proportionally from the enterprises and factories which maintain their production through exploitation of natural resources in mountain areas. In addition, the Government ought to increase investment to mobilise labour in mountain districts for road, irrigation system, and power system construction.

3. The main districts for agricultural investment in China are in the plains and along the coast. Investments get good returns in these districts. However, apart from grain and cotton farming, most other resources are abundant in mountain districts. Low interest loans should be allocated permanently for commodity production in mountain districts.

4. The native product tax, which has been levied since 1989, is suitable for most of the districts in the plains, but it is not suitable for poor mountain districts. The poor mountain districts ought to be either free from tax or lower taxes should be levied than those levied in the plains for native products.

5. Because of the move from a unified revenue and expenditure system to a differential system, government investment has shifted from poor districts to districts with highly efficient economies. Profits from enterprises, which were the main source of revenue in poor districts, are now taken by the State as payment for loans and interests. Financial reforms in poor districts should be responsive to the predicaments faced by such districts and should be different from those in developed districts.

6. The Government should introduce a special price system in poor districts. The more remote the district, the higher the price of farm and sideline products and the lower the taxes should be. Such a system could compensate for economic loss in poor areas.

7. Considering the significant role of science and technology in economic development in poor districts, the Government should formulate a policy to encourage education and scientific progress in poor districts. The salaries of scientists and experts who work in poor districts should be raised.

8. There should be preferential policies for tax collection, investment, loan and credits, and export and import for poor areas.

9. At present, officers at the lower basic levels are elected once every three years. This system is incompatible with the economic characteristics of poor districts. In poor districts, longer tenure is needed to implement effective policies and programmes.

FRAMEWORK FOR A DEVELOPMENT STRATEGY FOR POOR AREAS IN CHINA

Chen Guojie

1. Opportunities and Challenges in Impoverished Regions of China

Although great improvements have been made in the poor areas of China, a number of contradictions characterise these areas. These are outlined below.

Strategic Position vis-a-vis Low Economic Level

The poor areas are mainly located in mountain regions and in boundary areas between provinces, interiors, and frontiers. In spite of the strategic position, the low economic level in these areas at present has inhibited comprehensive, regional economic development.

The Conflict between Modern Needs and Cultural Traditions

Impoverished areas in China have insular, self-sufficient social formations in which minority nationalities live in compact communities. A good life according to traditional precepts in northwestern Sichuan means "storing something (that is butter, cake, and tea) inside their tent and tying some animals (horses, oxen, and sheep) outside their tent". The small-scale peasant economy is manifest in "raising pigs for a festival, raising sheep to keep out the cold, and raising chickens for exchange". Because they are afraid that "rich water flows into the field of another person", they are often not willing to open themselves to the outside world. They also close their areas because they are afraid that they will be exploited by the people of flourishing areas.

Poverty Alleviation vis-a-vis the Problem of Relative Poverty

Poverty alleviation efforts, at present, are not deep-rooted. The possibility of many counties reverting back to poverty still exists. Moreover, poverty alleviation efforts at present are focussed on the problem of absolute poverty. The problem of relative poverty is meanwhile becoming more acute.

Rich in Natural Resources and Poor in Development Conditions

Generally speaking, the poor areas possess abundant resources such as land resources, forest resources, grassland resources, mineral resources, and tourist resources, etc.

However, development of these resources is hindered by a number of factors, including inaccessibility, distance from major markets and urban-industrial complexes, frequency of natural disasters, climatic conditions, etc.

The Urgent Need for Investment vis-a-vis an Unfavourable Investment Environment

More investment is required in poor areas because of their poor economic foundations. Additional funds should be invested to improve the backward infrastructure, construct cities and towns, and enrich culture and education. It is only through higher investment that an economy of scale can be realised. However, to attract such massive investment, it is necessary to create a good investment environment. Unfortunately, investors are not willing to invest their funds in these areas because of many disadvantages, including poor transportation and communication.

Increasing Economic Development and Degrading the Ecological Environment

In order to get rid of poverty and reduce the gap between poor areas and developed areas, it is necessary to hasten the process and scale of economic development.

However, poor areas are often situated in ecologically fragile areas where the environment is severely degraded. Economic development of these areas can further aggravate environmental problems. Poor areas, such as the arid hill areas in Ganshu and Lingxia, the loess hill areas in north Shanxi, the stone mountain regions in the Luliang and Taihang Mountains, the alpine desert mountain region in Xizhang and Qinghai, and the desert areas in west Neimen and Xingjiang, have very little forests, are severely dry and fragile, and are susceptible to soil erosion, as well as frequent natural hazards such as landslides and debris flows, etc. Economic development efforts could easily trigger further environmental degradation.

The Problem of Human Resource Development and Technology

The development of poor areas depends mainly on the ability to turn primary products into a series of intermediate final products which are unique and excellent with high value. Furthermore, the key to economic development in the poor areas is to raise the level of industrial development and technology. Human resource development is the key to success.

Unfortunately, poor areas have a low level of HRD and technology. Over 30 per cent of the population in poor areas in China are illiterate. The fact that most of the technical personnel move to other regions makes it more difficult to develop the poor areas.

Developing Opportunities and Increasing Competition

Firstly, the development of a whole county needs both natural resources and markets for the poor areas. Secondly, there are possibilities of increasing the investment in poor areas as people from developed regions try to expand their economic influence and as the amounts of domestic and foreign investment increase. Finally, the central and local governments have been supporting and helping the development of the poor areas.

While opportunities for development are expanding, owing to the market economy, competition among different regions is also increasing. As the competition for domestic and foreign investment intensifies, this has become a great challenge for poor areas.

2. Development Strategies in the Poor Regions of China

Development strategies in the poor areas must make full use of the advantage of regional resources and rely on a combination of sufficient manpower and scientific technologies. Following the needs of the market economy, the emphasis should be on developing township enterprises, setting up point-axis systems of regional development, regulating the structure of regional industry, establishing industry with high output value and high profits, promoting unique and excellent products, speeding up light industries and processing industries, and, at the same time, helping in the development of the tertiary sector. In order to attract investment, it is also very important to expand infrastructure, mainly transportation and communication.

Tendencies to be Avoided

There are two tendencies that need to be avoided: the first is the tendency to be satisfied with the alleviation of 'absolute' poverty. This is dangerous, because it leads to development inertia. The second tendency is the hope of achieving quick results. Overestimation of achievements in the process of alleviating poverty can easily lead to establishing unrealistic goals, strategies, and methods of development. This can lead to strategic failure and the overall "restoration" of poverty which would seriously dampen the enthusiasm of the people. Generally speaking, it is impossible for poor areas to surpass developed areas without decades of arduous and unremitting efforts. There are three stages before the poor areas can catch up with developed areas.

Stage one: Narrowing the gap between poor and developed areas and taking care of absolute poverty. This stage should be achieved within this century.

Stage two: Keeping pace with developed areas in development. This goal could be achieved about 20 years after 2,000 A.D.

Stage three: Decreasing the gap between poor and developed areas with the possibility of surpassing the development level of developed areas.

3. Specific Problems Concerning the Development of Impoverished Areas

Exploitation of Resources

Past experience suggests that the following points should be taken into consideration.

Begin with Small Development Programmes. It is impossible for poor areas to attract big investments in a short period of time.

Aim for the Market and develop unique products with comparative advantages. Poor areas must begin with unique, marketable products to expand their influence, to establish their reputation, and to attract investment. For example, making use of the opportunities that pine mushrooms have in domestic and foreign markets, the people in Ganzi Prefecture have devoted their efforts to developing this product. As a result, in 1988,

1,020 tonnes were exported, worth 100 million *yuan*. The production of pine mushrooms has become a strong base for the regional economy.

Combining Short-term with Long-term Goals. The case of Miyi County will illustrate this. Inter-planting of apples (harvested after 7 years), peaches (shrub, harvested after 3 years), and non-irrigated crops (soybeans, radishes, potatoes, and melons, etc, ripe in one year) was carried out to take full advantage of the mountain ecology and to meet the needs of local peasants. In the first few years, because apple trees have few branches, non-irrigated crops, which are planted on the ground can grow well, so that some profits can be realised within the year; in addition, non-irrigated crops can be used as green fertiliser. After three years, the peach trees can yield profit. After the first few years, the apple trees begin to yield returns. Finally, apple production becomes the major agricultural activity. There are many cropping patterns like this which mix short-term with long-term profits in developing poor resources.

Education and Culture

It is impossible for the poor areas to catch up with the average development level without emphasising universal education and focussing on the training required to harness mountain resources. Conditions to facilitate these measures, such as better pay for teachers and scholarships and financial support to the meritorious and needy, have to be created.

Promoting Science and Technology

Science and technology, which are the key to comprehensive development, can be promoted through

- assigning adequate technical personnel to work in poor areas,
- providing training programmes,
- giving practical training to university students in poor areas,
- arranging visits for cadres and peasants to more developed areas, and
- enhancing production linkages between city-based enterprises and those in mountain areas.

Funds for Development

It is necessary for the government to put special policies into practice and to increase the investment in poor areas. At the same time, developed areas should also help the development of poor areas through the promotion of enterprises or through direct investment.

However, external efforts can only create the conditions, internal efforts are the decisive factor. For this purpose, poor areas should gradually enhance their ability to accumulate funds for investment and improve their capacity to reinvest.

Development strategies for poor areas should also take advantage of the availability of a large amount of cheap labour in these areas. Labour can contribute to the creation of

basic facilities and public development programmes such as highway construction, water resource projects, high output croplands, and the establishment of industries, etc.

As for the utilisation of funds, it is necessary to plan development projects carefully in the context of what is to be developed; where to develop it; which project should be given priority; and how to solve the problems of production, transportation, and marketing.

INTERNAL ECONOMIC ACCUMULATION IN POOR MOUNTAIN AREAS

Dai Sirui

The mountain areas, being generally remote and with poor communications, have long been isolated from the outside world. They are core poverty areas where economic development is far behind that of the plains' and coastal regions. Development in the 1980s freed many of the mountain areas from poverty, nevertheless, economic development is still rather slow, and people are still living in poor conditions. Several factors are responsible for the low level of economic development, but the lack of internal accumulation and the lack of investment are among the most important limiting factors.

Internal economic accumulation includes monetary investment, labour force, infrastructural facilities, and so forth. The present paper focusses on investment accumulation in poor mountain areas.

1. Accumulation of Material Production Industries in Mountain Areas

Investment is the initial source of economic development and is of decisive significance in the development of any economic system. Internal investment accumulation is derived mainly from material production industries (including industry, agriculture, building, transportation and communication, and commerce) and secondarily from the income from labour. The study and analysis of accumulation in the material industries are important and useful for a correct understanding of the characteristics of internal accumulation in mountain areas.

The accumulation of material production industries can be expressed as:

$$\Sigma M_{2i} = (\Sigma TR_i - \Sigma TC_i - \Sigma TV_i) - \Sigma M_{1i} \qquad (1)$$

where,

TR_i, TC_i and TV_i represent respectively the total income of production, total cost of materials used in production (including the depreciation of fixed assets), and labour payments, M_{1i} and M_{2i} refer to the taxes and duties provided and the accumulation invested by' the i-th industry. The part in parentheses is the total profit of all the material production industries. Obviously, accumulation is only a part of the total profit.

Based on this function, the following two situations for accumulation by material production industries can be envisaged.

1. When $(\Sigma TR_i - \Sigma TC_i - \Sigma TV_i) > \Sigma M_{li}$, i.e., the total profit is greater than the total taxes and duties, the material production industries contribute to accumulation, and the greater the profit, the larger the amount of accumulation which can be afforded.
2. When $(\Sigma TR_i - \Sigma TC_i - \Sigma TV_i) < \Sigma M_{li}$, i.e., the total profit is less than or equal to the total taxes and duties, there will therefore be no accumulation.

In poor mountain areas, there are several rigorous realities which make the increase of profit and the provision of more accumulation very difficult for production industries.

Firstly, the unitary industrial structure of mountain areas, which is based mainly on agriculture, has at least three limitations: firstly, it limits the development of potentially large profit-making industries such as product-processing, building, transportation and communication, and so on. Secondly, profit in these areas is primarily derived from agriculture, but agricultural profit is itself very limited and is greatly affected by natural weather conditions. Thus, the total profit in these areas is inevitably low and unstable. The efficiency of agricultural production sectors is low. This consequently hinders the optimal combination of essential production components and greatly limits the total profit. The reduction in total profit will certainly result in a weakening of the economic accumulation potential.

Secondly, science and technology and cultural and educational undertakings remain underdeveloped, and so technological and management levels are considerably low. The advancements in science and technology are difficult to extend to commercial applications in these areas. Therefore, both quality of products and economic benefits are low. As a result, increase of economic profits and accumulation through scientific and technological advancements remains obstructed.

Thirdly, mountain areas are generally remote and suffer from poor transport and communication facilities, scattered resources, and frequent natural disasters. This increases the costs of production and transaction and decreases comparatively profit and accumulation ability. For some products, local consumption is very limited because of an undeveloped economy and low purchasing power. The products often remain uncompetitive in outside markets, sometimes even resulting in economic losses.

Finally, poor mountain areas export their agricultural and mineral products, but import the processed end-products. Because of price differences between agricultural and industrial products, the terms of trade are not favourable to the mountains. This weakens the profitability and accumulating ability of mountain areas. According to an assessment made by Tang Zejiang of the Sichuan Academy of Social Sciences, the mountain districts of Wumengshan, Hengduanshan, Wulingshan, Qinbashan, and Liangshan lose up to 2,000 million *yuan* a year due to the low prices of agricultural and mineral products and the high purchasing prices of light-industrial products. This unequal exchange results in significant reduction in internal accumulation.

The primary source of economic accumulation is agriculture, and this remains an unstable sector in poor mountain areas. Therefore, in poor mountain areas, the development of industries must be accelerated and efficiency should be enhanced through application of science and technology.

2. Changes in External Investment and Internal Accumulation

Since there is little internal accumulation capacity in poor mountain areas, the Government has supported them by removing taxes, giving direct financial support, providing loans with no interest or low interest, and by making increased credit available. A considerable amount of money is allocated for poverty alleviation in such areas through various channels. In recent years, the labour export from poor mountain areas has been very high and the income resulting from labour export returns to the place of origin. These two types of capital income change the accumulation equation to equation.

$$M_2 = [\,(\Sigma TR_i - \Sigma TC_i - \Sigma TV_i)\,\Sigma TVM_{1i}\,] + (M_3 + M_4) \qquad (2)$$

where,

M_z is the total accumulation of the economic system of poor mountain areas, M_3 is the total capital supporting poor mountain areas, M_4 is the capital income from labour export, TR_i represents the scale of distribution and re-distribution, TC_i is used to compensate the consumption of productive material, TV_i represents the basic living requirements of labourers and their households, and M_{1i} refers to the consumption of non-material production.

Theoretically, the input of capital should increase total accumulation. This input of capital would then be able to facilitate the economic development of poor mountain areas. This is true in some areas. However, there are many areas where input of capital did not improve economic development and where it even led to loss of the input capital itself. This depends upon the different uses of input capital.

Input capital will induce different results depending upon the destination or areas of use. The destination of M_3 is generally arranged by the local government. The destination of M_4 is decided by the residents who own the capital. The exact destination of the capital depends on the combination of multiple factors.

Local government may have three possible choices of destination for M_3.

(1) If $[(\Sigma TR_i - \Sigma TC_i) - \Sigma T_i^i] > \Sigma M_{1i}$, that means the output of the production department can satisfy the basic living requirements of labourers and their families, the requirements of the non-production department, and even can provide some accumulation for enlarging reproduction. M_3 therefore may be used, in such a case, as additional input for expansion.

(2) If $(\Sigma TR_i - \Sigma TC_i) = \Sigma TV_i$, then the output of the production department can only compensate for the consumption in production and satisfy the basic living requirements of labourers and their families in the production department. M_3 therefore should be used to satisfy the requirements of administration, education, cultural, health, and other non-production departments. Only when residual capital remains can it be used to expand.

(3) If $(\Sigma TR_i - \Sigma TC_i) < \Sigma TV_i$, then the output of the production department cannot compensate for material consumption and satisfy the basic living requirements of labourers and their families. The support capital for poor mountain areas in such a case is insufficient to compensate and there is no residual for use in expansion.

There are also three possible ways in which M_4 may be used.

(1) If $[(\Sigma TR_i - \Sigma TC_i) - \Sigma TV_i] > \Sigma M_{li}$, that means family production output can, at least, compensate the material production and satisfy the basic living requirements of families and pay the taxes. M_4, therefore, may be used preferably for expansion.

(2) If $[(\Sigma TR_i - \Sigma TC_i) - \Sigma M_{li}] < \Sigma TV_i$, then family production output cannot satisfy the basic living requirements of families after extracting the material consumption and payment of taxes. M_4 certainly should be used to supplement any insufficiencies in the basic living needs of families and only the residual part can be used for expansion.

(3) When there is a possibility for all of M_4, or part of it, to be used for expansion and the expected efficiency of expanded production is very high, M_4 can be used for expansion. Otherwise, M_4 should be used for basic consumption or to save.

Poor mountain areas also receive some gifts of capital, low, or free interest loans from national and international organisations. The use of this input capital by local government is quite similar to the use of supporting capital from the national government.

The analysis above clearly shows that the total capital is not always used to expand production in all conditions and in all poor mountain areas. Whether it is used in production and how large a part is used to expand production is critically determined by the capital input tendency of local governments and residents.

The types and results of turnover vary distinctly with the destination of the input capital. When the capital is used for additional inputs, it will increase the total input, expand production, raise the supplemental level, and increase the economic foundation and accumulation if it is combined with native production. The type of turnover is characterised by currency capital being turned into production capital and turned into product capital through the production process. Consequently, it is turned into increased currency capital through the commodity exchange process. The increased value, realised through turnover in the production of input capital, can be used again as new additional accumulation to be invested into further expanding production. If input capital is not used for additional input, it will be used in different ways in consumption. As soon as input capital is used in consumption, it will lose the direct link with material reproduction and lose the potential for starting economic development and increasing accumulation.

It should be emphasised that it is only a possibility that input capital will initiate economic development and increase the accumulation of poor mountain areas when the input capital is used to increase input. For this possibility to be realised, we have to choose better projects, provide reliable technical support for the projects, provide services

for the processing and sale of products, optimise management, reduce production costs, and increase benefits. These problems can be quite difficult to deal with in poor mountain areas. These problems can be solved only when applicable and effective measures are put into practice.

3. The Internal Accumulation Mechanism in Mountain Areas

As poor mountain areas lack internal investment, it is necessary for governments to adopt preferential policies to support these areas. However, if an internal accumulation mechanism has not been formed, the money invested from outside will flow out rapidly. On the other hand, if a fine internal accumulation mechanism exists, the money invested will act as an engine to propel rapid development of the economy.

A fine accumulation mechanism is a mechanism that should absorb and drive internal re-investment. With this absorbing and driving force, even a little internal accumulation and outside investment will lead to expanded production. The economic development of poor mountain areas can be accelerated through this process. For this process to be operational, five measures should be taken into account.

Firstly, a mechanism should be set in motion that makes re-investment profitable. Only when investment and reinvestment can bring in economic benefits will investors take the initiative. This is relevant to two issues. Firstly, the correct investment decision and appropriate projects must be assured. In the initial stages, limited money should be invested in projects requiring little investment but yielding rapid results. Secondly, the price system needs to be adjusted. At present, most projects for economic development are concentrated in the field of farming and only a few are agro-processing projects. Under the current price system, investment in farming is not so profitable. Production increase does not always bring about profit increase. Nevertheless, the full development of agriculture is a prerequisite for economic development in poor mountain areas. Focus shuld be given to a price system that can ensure that agriculture is somewhat profitable.

Secondly, the loss of funds for investment and reinvestment should be prevented. Normally investment funds in poor mountain areas are often used for consumption of non-essential items. One method of preventing the loss of accumulated funds is to have effective management and supervision. Poverty alleviation funds should be allocated directly to enterprises and farmers to prevent misuse by the managing authorities. Lastly, management and supervision of the enterprises and farmers receiving poverty-alleviating funds should be enhanced to prevent funds from being shifted to non-productive fields.

Thirdly, capital accumulation through labour should be well organised in order to enlarge the sources of accumulation. Local governments should actively organise local labourers to plant trees, build roads, and transform low-yield fields so as to improve the basic conditions for economic development in poor mountain areas. Use of such labour should be well-planned to avoid waste or over-consumption of the labour force. Labour export from poor mountain areas is one important way of increasing internal accumulation. In Tongren Prefecture, located in the Wulin mountain area of Guizhou Province, income from

labour exports was over 75 million *yuan*, equivalent to a 25 *yuan* increase of annual per capita net income in the prefecture. Such income, if used well, can become a driving force to promote local economic development.

Fourthly, a favourable environment must be created to incorporate local resources in the poor mountain areas with resources from outside. Mountain areas are rich in natural resources, but lack money and technology. If inputs from financial investments and advanced technology can be well integrated with local resources, mountain areas can turn out market-competitive products. As a result, accumulation will rapidly increase. Wanyuan county, for example, is a poor area located in the Dabashan mountain area of Sichuan Province. Under the guidance of the technological team of Southwest Agricultural University, this county has popularised applied technology in areas such as crop planting, fish farming, animal raising, and agro-processing. For instance, leopard palm was once a wild plant there; through variety breeding, scientific planting, and fine processing, its products now have entered international markets. The output value of this new industry amounted to over 50 million *yuan* in 1991. This example shows that effective integration of outside advanced technology with the local resources of mountain areas can play an important role in promoting economic development and enhancing the accumulating capacity of mountain areas.

Fifthly, a set of rules and regulations needs to be established for internal accumulation in poor mountain areas. As it is, the enterprises and farmers decide upon the input, the investment is therefore uncertain and unstable. An effective way to overcome this difficulty is to set up a foundation for mountain area development, which can consist of a some internal funds, funds for poverty alleviation, and other sources. A special organisation can be established to manage the foundation and to decide which important projects to undertake. In this way, the instability of investment and reinvestment would be largely reduced.

If all these five measures are implemented properly, a fine accumulation mechanism would be in place to sustain the economic development of poor mountain areas.

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ANALYSIS OF THE INDUSTRIAL STRUCTURE IN POOR VILLAGES IN XING YUAN COUNTY, SHANDONG PROVINCE

Gao Guan

1. Characteristics of the Production Structure in Xing Yuan County

Xing Yuan county is one of the poor counties in Yimeng district, Shandong Province. There are 357 villages in the county and the annual per capita income was lower than 200 RMB *yuan* in 1985. These villages account for 56 per cent of the total number of administrative villages in the counties. Investigations in the 357 villages in 1991 showed the following characteristics of the industrial structure (Table 1).

1. Production is dominated by agriculture. The profits from agriculture account for 80 per cent of the gross profit. Plantations and animal husbandry are the main occupations. The proportion of forestry, sideline occupations, and fisheries in the industrial structure is lower than 10 per cent.

2. Construction is the major industry, ranking after agriculture.

3. Transportation is the third major industry.

Table 1: The Industrial Structure of 357 Poor Villages in Xing Yuan County (1991)

	Amount (10'RMB *yuan*)	Proportion (%)
Gross income	13,489.33	100
Primary Activities (Agriculture)	10,710.53	79.4
Plantation	6,608.39	48.9
Farming	2,859.70	21.3
Forestry	813.99	6.0
Side occupations	409.31	3.0
Fisheries	19.14	0.2
Secondary Activities	390.11	10.3
Industry	471.77	3.5
Town and village enterprises	141.31	1.0
Construction	777.03	5.8
Tertiary Activities	388.69	10.3
Transportation	440.91	3.3
Commerce and restaurants	195.80	1.5
Services	173.58	1.3
Others	578.40	4.2

2. Industrial Structures and Poverty

We compared the villages with the highest incomes and the villages with the lowest incomes among those listed as poor villages by the Government and found that there was a big difference in their industrial structure. In Hanwan village, the village with the

highest income among the poor villages, the annual per capita income is up to 757 RMB *yuan* and exceeded the annual per capita income in wealthy villages. The income from non-agricultural occupations accounts for 32.2 per cent of gross profits; the income from industry accounts for 18 per cent of gross profits. In Yangjaling village, the village with the lowest income among the poor villages, the annual per capita income is only 148 RMB *yuan* and all of it is from agricultural production. Villages with predominantly agricultural incomes were impoverished (Table 2).

Table 2: Comparison of the Industrial Structure between Developed and Undeveloped Villages (1991)

Types	Income (Per cent)		Annual Personal Disposable Income (Average)
	Agricultural income	Non-agricultural income	
Undeveloped villages (357)	79.4	20.6	362
154 villages where the average per capita income is below 300 RMB *yuan*	87.0	13.0	
203 villages where the average per capita income exceeds 300 RMB *yuan*	74.7	25.3	
Developed villages (297)	57.0	43.0	730
Total (636)	64.3	35.7	546

In general, high per capita disposable income in towns and villages is associated with secondary and tertiary industrial activities. The results suggest that industrial development plays a leading role in the alleviation of poverty in impoverished areas (Table 3).

3. Problems in Adjustment of the Industrial Structure

In order to make efficient use of mountain resources, the government department of Xing Yuan county proposed a series of measures to adjust the industrial structure in 1986. The measures included reducing the area under grain crops, afforestation on formerly cultivated sloping lands, fruit farming, and animal husbandry. Forestry and animal husbandry were emphasised as the main bases of production. The implementation of these measures changed the composition of the rural economy.

After several years of effort, the industrial structure in Xing Yuan county has undergone changes. The proportion of area under crops has decreased and the proportions of forestry, animal husbandry, and fisheries have increased. The increase in animal husbandry is especially obvious. Forestry has developed relatively slowly. The proportion of sideline occupations is lower than the level in 1984. These changes suggest that there are many barriers to the development of non-agricultural occupations.

Table 3: Industrial Structure and Incomes in Poor Villages, Xing Yuan County, (1991)

Villages and Towns	Number	Gross Income						Personal Disposable Income (RMB *yuan*)
		Total	Agricultural Income	Non-Agricultural Income				
				Total	Industry	Construction	Tertiary occupations	
Hanwang	14	100	60.69	39.11	12.98	12.28	13.85	491
Tumen	10	100	58.60	41.40	14.10	9.40	17.90	489
Nanma	15	100	43.30	56.70	24.00	7.80	24.90	383
Zhangjape	26	100	88.00	12.00	0.70	4.20	7.10	372
Dongli	40	100	81.40	18.60	5.20	4.20	9.2-	365
Yuanzhuang	30	100	82.30	17.70	3.80	3.60	10.30	344
Gouque	12	100	85.00	15.00	4.00	5.70	5.30	337
Shiqiao	21	100	78.00	22.00	6.00	4.50	11.50	334
Shancha	32	100	87.00	13.00	0.70	2.10	10.20	330
Shobeilin	23	100	84.00	16.00	3.40	4.60	8.00	328
Dazhangzhuang	32	100	93.00	7.00	1.00	1.60	4.40	314
Zhongzhuang	22	100	88.00	12.00	0.30	2.40	9.30	306
Jingxing	19	100	81.00	19.00	2.70	8.00	8.30	299
Xujazhuang	14	100	76.00	24.00	2.30	12.5	9.20	297
Yanya	17	100	87.00	13.00	1.10	4.40	7.50	288
Louchong	30	100	76.00	24.00	1.60	7.70	14.70	271
Total	357	100	79.40	20.6	4.50	5.80	10.30	362

Note: Industrial income includes allocations for town and village enterprises.

The development of industries is severely limited in most of the poor villages. Generally speaking, the limitations are due to

- high transportation costs;
- low economic efficiency because of the small scale;
- lack of trained manpower; and
- paucity of funds.

As a result the industries in poor areas do not have a competitive edge.

Because of increased population, low efficiency of agricultural production, and changes in market demands, the profits from agricultural production are very low. In 1990

agriculture accounted for only 37 per cent of the gross profit in Xing Yuan county. Even though products such as silk and tobacco were in great demand in the market, the response of the peasants was not enthusiastic because these products were purchased by the government at low prices.

4. Strategic Considerations

The general experience of economic development in China suggests that the sectors that can make efficient use of the resource advantages should be chosen as the lead sectors. Agricultural processing is the connection between agriculture and industries. Silkworm farming in Xing Yuan county is a traditional occupation and has been managed for more than two thousand years. The production of silkworms in Xing Yuan is the third largest among the counties in Shandong Province. There are 488 villages where peasants are involved in producing cocoons and which account for 70 per cent of the villages in the county. Traditional experience, large-scale production, and high efficiency are the advantages in silkworm rearing and cocoon production. Silkworm farming is also closely related to agriculture and forestry. The plantation of mulberry trees can improve environmental conditions, and the branches and bark of trees can be used for paper making. The root of the mulberry tree is an ingredient in Chinese medicine. The side products of sericulture, such as the silkworm chrysalis and excrement, can be fed to pigs, cattle, sheep, and fish. The silkworm chrysalis is also an excellent protein ingredient which can be used to produce mixed forage and which can be refined into resolutive proteins. Silkworm excrement is a highly effective fertiliser. The amount of excrement produced by the silkworm on one *mu* of mulberry trees is equal to 10kg of nitrogen fertiliser. Sericulture can also prompt the growth of the textile industry. Furthermore, the economic returns from sericulture are high.

In spite of the potential, sericulture has not done well in Xing Yuan county because of government policy. The government purchasing price for cocoons is low and trading in silk is a government monopoly.

The promotion of agro-based and related industries in poor mountain areas should be based on

- transfer of light industries (such as silk-processing and textiles) to poor mountain areas;
- integrated planning of raw material production and processing;
- emphasis on efficiency of production through application of technology and training; and
- preferential tax and credit policies for industrial growth in poor mountain areas.

A STUDY OF THE MAIN PROBLEMS LIMITING DEVELOPMENT OF POOR MOUNTAIN AREAS: THE CASE OF THE CHAOYANG MOUNTAINS

Wang Benlin
Cheqwen Zhang

The Chaoyang mountainous area lies in Western Liaoning Province. The total area is 19,698 square kilometres, including one city, two districts, and five counties. The total population of the area is 3.18 million, of which 2.49 million are in agriculture. The density of the population is 162/km^2.

1. Development Characteristics of the Chaoyang Mountain Area

The area is located between the developed coastal area and the undeveloped Inner-Mongolian area. The level of development in this area is higher than the average for the nation's poor areas, but it is still very low compared to the developed areas. In 1990, income per capita in this area was 831 *yuan*, though it varied considerably in different counties. However, the problem of the lack of basic living conditions has not been solved in most parts of the area.

Most of the area ranges from 500 to 1,000masl. The plains account for 21 per cent, the low mountains and hills respectively account for 37 and 42 per cent of the area. Soil erosion is a serious problem and involves about 52.3 per cent of the total area. Sloping land makes up two-thirds of the cultivated land. The soil quality is poor, the content of organic matter being between 0.24 per cent and 0.85 per cent, and productivity is low. The area falls into the arid-humid climatic region. Annual rainfall is from 440 to 550 millimetres, 71 per cent occurring in June, July, and August. There are many gales and strong sunlight in spring. This intensifies evaporation and leads to serious drought and water shortages. Between 1952 to 1980, spring drought occurred during 13 years and summer and autumn droughts occurred for 10 and five years respectively. Drought threatens both agriculture and stock raising.

There is considerable disparity in development. Industries are concentrated in Chaoyang city, Lingyuan county, and Beipiao city and other county towns. There are few industries in most other areas. Ninety-two per cent of industries, 80 per cent of county towns, and 67 per cent of irrigated cultivated land lie in the Daling River Basin. Jianping county and Chaoyang county are particularly poor areas. Poverty is prominent.

2. The Primary Problems of Development in the Chaoyang Mountain Areas

Rapid increases in population and low levels of human resource development are the most important factors limiting the development of poor mountain areas. After liberation, the population in the area nearly doubled. Although the national income increased by 198 per cent, the national income per capita increased by only 120 per cent. A considerable

percentage of the increased national income is consumed by the increased population. Chaoyang city is now experiencing high birth rates. The population is predicted to be about 3.5 million by 2,000 A.D. In the area, 23.7 per cent of the population are illiterate or semi-illiterate. Forty per cent have received primary education and only 11 per cent college education.

Shortage of funds is another key factor limiting the development of poor mountain areas. Chaoyang city generates only 48.7 per cent of its budgetted expenditure. Development of processing industries, strengthening basic facilities for agriculture, or developing technical education, all of these need large amounts of funds.

The backwardness of transportation and communications is also a barrier affecting the development of poor mountain areas. Transportation and communications are not well-developed because of the mountainous topography. The railway capacity is low. Highways remain undeveloped. For instance, Jinzhou-Chengde railway has only a 60 per cent freight capacity to Chaoyang city. It is predicted that the disparity between freight transportation needs and transportation capacity will be 70 million tonnes by the year 2000.

The prospects of development in the coastal areas and the policies of local and national government are also important factors affecting the economic development of Chaoyang mountain areas.

The area and population of Chaoyang mountain areas account for one-seventh and one-tenth respectively of those of Liaoning Province. During the period from 1949 to 1985, fixed assets' investment in Chaoyang city by the State was only one thirtieth of that of the province as a whole. During the period of the Sixth Five-year Plan, this proportion fell to one forty-eighth and is still falling. Recently, the opening of Liaodong Peninsula and the pursual of policies favouring developed coastal areas have brought new difficulties for the development of poor areas.

3. Suggested Measures to Stimulate Growth in Chaoyang

On the basis of experience the following measures to stimulate growth can be suggested.

Strict Control on the Increase in Population and Expansion of Education

There is an urgent need to intensify people's acceptance of family planning and to strictly control the population increase. Education has to be expanded, particularly at primary levels. Technical education and training to enhance productivity are other areas requiring urgent attention.

Expansion of Financial Resources and Their Efficient Use

There is currently a large gap between the need and the availability of financial resources, particularly investment funds. Priority should therefore be given to developing those industrial and agricultural products which can bring in large revenues. Mountain areas have sufficient mineral and agricultural resources, so it should be possible to attract both

internal and external private investment to the areas. At the same time, the available funds must be used efficiently.

Financial resource needs' projection shows that, by the year 2,000, Chaoyang city alone will need 12,347 to 13,534 million *yuan*. It will, however, only have the capacity to generate 5,786 million *yuan*, i.e., around 40 per cent of its needs. Therefore, all sources of financial resource mobilisation, including national investment loans, funds for developing poor areas, credit facilities, and foreign investment should be tapped.

Investment in Infrastructure

One of the most prominent characteristics of poor mountain areas is the backwardness in transportation and communications. As far as Chaoyang city is concerned, the railways should be rebuilt and improved to enhance their transportation capacity. This is particularly true for the Jinzhou-Chengde and Qianxi-Shenyang railways. In the mean time, it is also important to accelerate the construction of highways and to intensify highway transportation capacity. The highway connecting Chaoyang city and Jinzhou seaport should naturally receive priority. This calls for a massive increment in investment in transportation and communication.

Economic Integration of Rich and Poor Areas

In recent years, the national strategy has been to give priority to the economic development of coastal areas. Consequently, in Liaoning Province, the priority is for the economic development of Liaodong Peninsula. Acceleration in economic development in coastal areas can bring about the economic development of other areas and even of the whole nation. To some extent, this strategy adversely affects the development of interior areas, especially poor mountain areas, and the productive potential of these areas remains neglected. For example, Chaoyang city is the biggest base for cotton and wheat and an important base for fruit production in Liaoning Province. It is also the source of the Liaohe River and therefore an area for water and soil conservation. If Chaoyang city develops properly, it can ensure the development of the economy and ecology and environment of the coastal areas of Liaodong Peninsula and the whole province. Investment in these aspects in Chaoyang city actually contributes to development of the coastal areas and the province. Therefore, it is important to harmonise the relationship between developed areas and poor mountain areas.

Lastly, it should be emphasised that the development of poor mountain areas must consider economic benefits, social benefits, and ecological benefits simultaneously. Unless the three aspects are well coordinated, it is difficult to solve the problems affecting the development of poor mountain areas. There is no single policy measure that can change the face of poor mountain areas. Only when measures for controlling the population, preserving, and improving the environment, developing transportation and communications, accumulating funds, using external investment, and favourable State policies are made to work in a coordinated fashion can poor mountain areas develop rapidly.

KEY PROBLEMS AFFECTING THE DEVELOPMENT OF POOR MOUNTAIN AREAS

Ma Hongyong

In spite of natural resource potentials why are many mountain areas in China so poor? A number of factors (both internal and external) have contributed to the poverty in mountain areas.

1. Effects of Internal Factors

Poor mountain areas in China are often remote areas that were old revolutionary bases and inhabited by minority nationalities. These areas have a low productive capacity in relation to production in the plains. Traditionally closed economies and historic discrimination by feudal rulers are internal factors that have contributed to poverty in mountain areas.

2. Effects of External Factors

Because of their geographic locations, mountain regions lack basic infrastructure and remain disadvantaged in terms of financial resources, technology, and qualified manpower. In spite of the abundance of natural resources these regions have long been separated from the outside world. Further, the government policy has encouraged investment in accessible regions which have better development infrastructure, not only for development projects but also in areas like education and culture.

Dealing with Poverty in Mountain Areas

In terms of the causes and characteristics of poverty in poor mountain areas, the following countermeasures should be adopted in order to alleviate poverty and initiate a swift process of economic development.

(a) As far as any development project in mountain areas is concerned, economic development, comprehensive use of natural resources, and environmental safeguards must be considered as a social package.

Integration of economic and environmental development must be reflected in economic returns, ecological benefits, and social benefits in the short or the long-term, at local, regional or national levels, or collective and individual benefits. In order to bring the natural, social, and economic advantages of the poor mountain areas into full play, economic development and environmental development must be conceived of as a package.

(b) It is necessary to realise the strategic importance of agriculture, so the emphasis should be on developing agriculture whenever the opportunity exists. It is necessary to change the existing traditional land management practices in favour of intensive management, so that agriculture and industry grow in a balanced way.

For this reason, economic development in mountain areas needs more investment for the completion and repair of infrastructure, farmland, and irrigation channels. Also, efforts should be made to control water and soil erosion and to carry out scientific farming based on intensive management. Based on the policy of self-sufficiency in grain, the non-agricultural sector should be developed. The rural economy should be developed through coordinated development of agriculture, forests, animal husbandry, sideline production and fisheries, industry, commerce, the building industry, transportation, and the service industry.

(c) The experience of more than a decade has proved that developing a commodity economy is an effective way to end poverty in rural areas. Developing township industries to seek additional income is another way of dealing with poverty. It also mobilises the farmers to develop a commodity economy and to make full and rational use of natural and socioeconomic resources. All the old ideas, concepts, and traditions that are unfavourable for developing a commodity economy and opening up to the outside world should be avoided.

(d) Priority should be given to hastening the construction of infrastructure and market towns. These include the basic construction of water supply works, electricity and roads, basic farmland construction, and development of market towns. The lack of such basic infrastructure seriously hinders economic development in mountain areas. High mountains and long distances in poor mountain areas make transportation difficult, thus hampering exports as well as imports.

Marketing is a major problem in the mountains. Therefore, market towns should be set up in rural areas of the prefectures and counties in a planned way. Market towns are the political, economical, scientific, and technological centres in urban and rural communities and also the providers of social services. Market towns help develop small-scale markets of various kinds and act as collecting and distributing centres. With these markets the natural resource advantages in mountain areas can be explored, and manpower, capital, and technologies can be attracted. Market towns can play a decisive role in developing commodity economies in poor mountain areas.

(e) Economic development in poor mountain areas depends on the uses of science and technology, and the development of sciences and technology is dependent upon qualified personnel. With the development of a commodity economy, there is an increasing demand for personnel qualified at the management, technical, and professional levels. Appropriate policy measures should be adopted to retain qualified professionals in the mountains and prevent their outflow to other regions.

The introduction of technologies in the mountains should focus on practical techniques. It is also important to take advantage of advanced technologies that hold promise for the development of natural resources in mountain areas.

(f) One of the important factors hindering economic development in poor mountain areas is the high population growth rate. Family planning and mandatory birth control measures are still necessary. Mountain areas - for various reasons - have a high proportion of disabled in the population. The social and economic needs of this population have also to be taken into account. This makes family planning an extremely essential task.

(g) A number of other preferential policies needs to be adopted in poor mountain areas. Some of these are given below.

i) A support and protection policy for special forests that provide a base for specialised industries.

ii) Preferential policies for the development of mineral resources, processing industries, the construction industry, and the transportation industry.

iii) Food supply remains a pressing problem in the mountains. The mandatory State grain purchasing quota in these areas should be reduced so as to encourage the initiative of local inhabitants to work hard for self-sufficiency in food.

iv) Apart from the above-mentioned policies, there is a need for special policies in many other fields such as an industrial policy, tax collection policy, credit policy, training policy, aiding-the-poor policy, investment policy, and "three wastes" disposal policy, etc.

It should, however, be noted that outside aid can only help, the basic initiative for poverty alleviation has to come from the local inhabitants.

EXPLOITATION OF MOUNTAIN RESOURCES AND DEVELOPMENT OF THE MOUNTAIN ECONOMY

Shi Yulin

1. Resource Characteristics of the Mountainous Areas of South China

Among the mountainous areas of China the tropical and sub-tropical zones of south China manifest the highest development potential. The mountain and hilly areas of tropical and subtropical China (i.e., the area south of the Huihe River and east of the Yungui Plateau) occupy about one million square kilometres. This region has 11.34 million ha of farmland, 53.4 million ha of forest land, three million ha of marginal land suitable for agricultural use, and 77.7 million ha of bare mountain and grass slopes suitable for forestry and animal husbandry. Temperatures are high, the rainfall and water resources are abundant, and the altitude is moderate. Mountains and hills are alternated with valleys. The land has high productivity and timber grows fast. Here the timber forest needs only about 20 years to reach maturity, while the forests in the northeast need 50 to 60 years, and the forests in the high mountains and deep gorges of southwest China need about 80 years to reach maturity. Land resources in mountainous areas of tropical and subtropical China not only have high productivity but are also suitable for a wide range of uses from tea plantations to subtropical fruits, including citrus fruits, bananas, litchies, lungan, and pineapples. They are also suitable for grain crops, cash crops, and the development of animal husbandry. Mountainous areas of tropical and subtropical China are richly endowed by nature.

2. The Need to Change from Monoculture to a Diversified Economy in Mountain Areas

In the mountain areas of China, only eight to nine per cent of the total land is used for agriculture. Sloping lands, which make up about 90 per cent of the total land area in the mountains, remain completely neglected. Monoculture is one of the important reasons for undeveloped economies in these areas. The idea has been only to "use the mountain" and not to "conserve" the mountain. Over-cultivation, over-cutting, and over-grazing have not only destroyed the resources but have also degraded the environment. The way out for the development of mountainous areas is to strengthen river valley and plains' agriculture and focus on fruit and trees on the slopes.

The Qianyanzhou experimental station in the red earth hilly mountain district of Taihe county in Jiangxi Province provides an example of this. Of the 200ha of land in 1983, about 14.7ha (6.6 per cent) were used for cereals, and 33ha for orchards (16.6 per cent) where citrus trees were planted for commercial production. On 113.4ha of forest land, Slash pine *(Pinus elliottii)*, Masson pine (*Pinus massoniana*), and fir (*Abies*) trees were planted for the development of forestry and to conserve the environment. About 8.9ha of ponds and reservoirs were constructed for the storage of water. Thus long-term benefits were combined with medium and short-term benefits. In 1990, there were 56 families and

241 persons in the station area. With a per capita net income of about 1,400 *yuan* annually, there was an eleven-fold rise in income. Forest coverage increased from four to 62 per cent, and soil erosion was fundamentally controlled. The output of citrus fruits makes up 72 per cent of the total agricultural output. In about seven to eight years, forestry and sideline production will provide a considerable source of income for the station.

Another example is Miaoguo village in Yannan Prefecture, Shaanxi Province. It has a population of 5,000 with 100 families and 666.7ha of land, out of which farmland constitutes 500ha. Not long ago, 333ha of this farmland were returned to forest or grassland. So today there is only 167ha of farmland. Terraces were built and intensive agriculture practised. Apple trees were planted on 153.4ha and 226.7ha were devoted to timber forest, with about 100 ha of grassland for grazing. This village changed from monoculture and extensive farming to diversified agriculture and intensive farming.

In order to develop mountain resources, the special features of mountainous areas and local conditions should be given due consideration. Natural resource use should be guided by consideration of natural comparative advantages. Agriculture, industry, and trade should be allowed to evolve as a complete system.

Section C

Approaches to Poverty Alleviation: Area Development and Natural Resource Management

RURAL DEVELOPMENT IN POOR DISTRICTS IN NORTH CHINA: THE MOUNTAIN DISTRICT OF THE EASTERN YAN MOUNTAINS

Li Guiseng

Introduction

The poor districts in north China cover an area from Qin Ling Mountain and Hui He River in the south to the country boundary in the north and from the Loess Plateau in the west to the coastline in the east, including the Yimen, Taihang, Yan, Nuluerhu, Daltinggan, and Changbai mountain ranges. Among the 551 poor counties in China, 55 are located in the mountain ranges of north China. There are eight counties in the Yimen mountain range, nineteen in the Taihang mountain range, twenty-three in the Nuluerhu mountain range, two in the Daltinggan mountain range, and two in the Changbai mountain range. In 1987, there were 18.403 million people in these fifty-five counties. The grain production per capita per year was 323.5kg, and the agricultural production per person was 297.5 *yuan*. Grain production per hectare was 2,059.5kg, per capita grain production, agricultural production, and per hectare grain production in the mountains of north China were 46.1, 18.2, and 76.6 per cent lower than the national average respectively.

Rural Development in Poor Districts of the Eastern Yan Shan Mountain Range

The Eastern Yan Shan mountain range lies in Hebei Province. It includes Chengde and Qinghuangdao city, Chende, Fengning, Huichang, Xinglong, Longhua, Pingquan, Kuanchen, Luanpin, Qing Long, Funing, Lulong, Fengrong, Zhonghua, Qiexi, and Qiean cities and counties. About 7.5 million people live in an area of 52,000 square kilometres, which accounts for 27.6 per cent of the population and 12.3 per cent of the provincial land area.

Physical Conditions and Socioeconomic Characteristics

The eastern Yan Shan mountain range is mainly composed of low hills, the highest peak, Wulin Mountain, being 2,110m high. The annual average temperature is 7.6°C, the highest being 37°C, and the lowest -30°C. There are less than 130 frost free days in a year. Annual precipitation is 563mm and 64 per cent of the days are sunny.

Soil types include brown, drab, and grassy marshlands. The percentage of humus and organic materials in topsoil is four to six per cent, and soil thickness is only about 10-25cm. Soils are thin and the area lacks water and adequate temperatures, conditions which are disadvantageous to farming. On the other hand, abundant sunshine and radical fluctuations between day and night-time temperatures are advantageous for fruit and cornflowers. Therefore, agricultural management in this area should take advantage of such conditions.

In 1990, crops accounted for 48.3 per cent, forestry for 7.7 per cent, animal husbandry for 30 per cent, sideline production for 12.5 per cent, and fisheries for 1.5 per cent of the total production. Forestry, animal husbandry, and sideline occupations are the main components of the economy. The annual income per capita was 467 *yuan* and was 40 per cent lower than the average for Hebei Province (778 *yuan*).

Bohai Sea lies to the southeast, Beijing city to the west, and Tianjing city to the south of this area, so it has access to harbours and big cities; making it attractive for outside investment and professionals. There are also several medium-sized cities in this area, e.g., Chende, Qinghuangda, and Tangshang, which to some extent have developed industries.

The Main Causes of Poverty

Fragile Ecological Environment

There is a serious soil erosion problem in the mountainous districts because of the destruction of vegetation. Natural calamities are frequent. Land areas with slopes below 5° account for only 7.3 per cent of the total area, and land areas with slopes above 25° account for about 40 per cent of the total land area. Geomorphological conditions limit agricultural development. In some villages there is only 0.04ha of cultivated land per capita and irrigation conditions are poor. Topsoil layers are thinner than 20cm in 51.2 per cent of the total land area, and this limits the expansion of agriculture, forestry, and animal husbandry.

A total of 0.28 million ha of land is subject to serious erosion. Desertification is a prevailing process in the north. For example, in Weichang county, more than 60 thousand ha of land are desertified, accounting for 23.5 per cent of the total area of the county.

Natural disasters ensue from such a degraded environment. Flash floods and droughts are frequent with consequent damage to crops and cropland.

Poor Management and a Conservative Outlook

Because of lack of awareness, management and cultivation techniques are poor. The people are easily satisfied and focus only on the present.

Lack of Professional Manpower

In the seven counties of Chengde district, there are only 3,196 agricultural professionals. The ratio of professionals to peasants is 1:695. On an average one professional is responsible for 567ha of forest and 99ha of cropland. Professionals who really engage in agricultural production are few and there are almost no industrial or economic management professionals.

Deficiency of Funds

The average annual revenue per county is only 10 million *yuan*. The Government provides another four to five million *yuan* to each county. Most villages have no internal financial accumulation. Considering the lack of collateral, it is difficult for these villages to receive loans or bank credits.

A Blueprint for Development

Development of Livestock

Because the environment in this area is very fragile, the frost-free period short, and crops harvested only once a year, cultivation is limited and has little potential. The potentials for forests are also limited because of the long production period. Fisheries cannot be the dominant activity in the area. Small livestock are less influenced by climate and environment and need smaller investments to facilitate rapid returns. At present, raising pigs, chickens, and rabbits should be emphasised. Cattle can also be raised in areas where conditions are advantageous.

Developing a Home-yard Economy

The home yard is an important component of the rural economy in mountain districts in north China. It is used for planting crops and raising animals and accounts for 7.2 per cent of the cultivated land. There is 0.02ha of home-yard land per family. The efficiency of home-yard cropping can be two to five times as high as field cropping. For example, the planting of cornflowers can yield benefits worth 1,500 *yuan* from 0.007ha of land, planting grapes can yield benefits worth 300-500 *yuan* per 0.007ha, and raising rabbits 1,000 *yuan* per 0.007ha. Home-yard land needs a small amount of investment but can give substantial returns.

Proper Management of Town and Village Enterprises

The establishment of town and village enterprises needs investments, expertise, new techniques, and government support. Projects for town and village enterprises should be carefully selected and planned. Enterprises should use local natural resources and should be developed steadily. Enterprises for transportation, flowers, fruit preservation, and packing goods can be developed in districts that are near the cities and where road conditions are good.

Education and Professional Training

The main reason for the lack of professionals and experts in this region is that there are few training institutions for agriculture, forestry, and animal husbandry. Professionals and experts working on the research and management of crops suffer from the lack of refresher courses, and their salaries are also low. Most of them leave for jobs elsewhere. The policy should be to encourage young professionals and experts to stay in rural areas.

Preferential Policies

Government policies should stengthen the economy in mountain areas so that people become independent of government financial aid. Examples of such policies are given in the following passages.

Reducing Taxes. The government should reduce taxes and give preference in material and energy supplies and in the construction of transportation lines. The average annual income per capita in the area is approximately 300 *yuan*, but per capita annual expenditure on various fees and taxes accounts for about seven per cent of the total income. In addition, the prices of seeds, fertilisers, pesticides, and energy increase, continuously exerting a heavy burden on the peasant farmer. Their annual incomes are only sufficient for food and clothing, and they cannot invest in increasing production. Even the existing infrastructure cannot be used effectively because of the deficiency of funds. For example, the irrigation system is unused because the farmer cannot afford the increasing cost of electricity. The area of cultivated land has decreased because the peasants cannot afford gasoline for the equipment. Crops and animals cannot be protected from diseases because pesticides are too expensive. The deficiency of funds discourages farmers and impedes agricultural production.

Improving the Environment for Investment. The district governments should improve transportation, education, environment, and service conditions in as short a period as possible in order to improve investment conditions. Government procedures for investments, interest rates, and land use, as well for foreign investments should be liberalised.

Increase the Input of Funds and Technology into Poor Mountain Areas. So far government investment in poor mountain areas has been limited. Increased investment and technology for the development of poor mountain areas are urgently needed.

THE RURAL POVERTY AND RESOURCES' PROGRAMME OF THE FORD FOUNDATION IN CHINA

N. Menzies

Background

It has now been more than ten years since China abandoned the centrally-planned collective system of agriculture in favour of a return to household production. Agricultural reforms and poverty alleviation efforts have brought a modest level of prosperity, at least to the majority of the rural population, but the consequences of this transformation of rural society and the implications of reform for China's rural population are still poorly understood. Poverty was widespread during the late 1970s, and China has achieved the rare distinction of eradicating it from most of the country. Nevertheless, poverty still exists and affects large numbers of people. The Foundation's Rural Poverty and Resources' Programme supports efforts by government agencies and a number of key advisory institutions to respond to the challenge posed by persistent poverty and to work with impoverished communities to find and test more effective ways to carry out poor area development.

The overall direction of change in rural China has been towards the relaxation of government controls over inputs and marketing, giving farmers more say in the decisions which most affect their lives. The long-term trend, however, conceals frequent shifts and changes between an emphasis on market forces and individual household production or on central planning and collective efforts. The uncertainty caused by these changes is reflected in the diminishing enthusiasm among farmers for activities which do not bring rapid returns to the individual, and local officials often resort to financial pressure or even coercion to carry out tasks such as the maintenance of irrigation systems, construction of terraced fields, or reforestation.

The strong reaffirmation of market-oriented reform made by the Chinese leadership in early 1992 prompted a sharp burst of investment in township and village enterprises in rural China, often using local government funds redirected from the traditional agricultural sector. The scale of this reallocation of funds has been such that many local governments have been unable to pay farmers for official obligatory purchases of grain and have resorted to IOUs, which are not always honoured by the agricultural banking system.

These problems are felt particularly severely in those parts of the country which have difficulty in taking advantage of the new opportunities offered by the reforms. While the coastal regions are rapidly becoming economic 'dragons', the inland provinces advance more slowly, and poverty persists in many areas. The nature and distribution of poverty have changed over the last ten years so that it is now confined to isolated areas, usually mountainous, where ethnic minorities are often, in fact, the majority. Large-scale, uniform poverty alleviation programmes will no longer have the impact that they used to

have in the past. A shift in emphasis is needed from general rural development programmes to programmes that specifically target the poorest communities and the poorest people in those communities.

RPR Strategy

Against this background of a difficult adjustment to new social and economic forces, there is a need for informed thinking and debate to guide policy-makers and for opportunities to test fresh approaches to rural development and poverty alleviation. The Foundation's Rural Poverty and Resources' (RPR) Programme works with decision-makers at the national and provincial levels of government to help strengthen their capacity to analyse the persistence of poverty, to assess different strategies for action and their consequences, and to generate the information they need to formulate effective policies. To complement this work, the Foundation supports village-level programmes to test new approaches to the alleviation of poverty in rural areas which encourage a partnership between government agencies and farmers, giving farmers a stronger voice in decisions affecting their future and their prosperity.

National Level

In 1986, China's State Council established an inter-ministerial 'Leading Group for the Economic Development of Poor Areas' (the Leading Group) with a mandate to formulate and implement policies for the eradication of rural poverty. The Leading Group, with its network of offices reaching from the national capital in Beijing to all officially designated poor counties, is perhaps the most influential agency working on poor area development in China. It cooperates with other agencies operating in poor areas and with key research institutes in developing a better understanding of the dynamics of rural poverty and strategies to eliminate it.

The Foundation works closely with the Leading Group and the institutions with which it works to strengthen their capacities to carry out this task. It has supported a number of fora in which participants are given opportunities to engage in dialogue on specific issues related to poverty and to exchange experiences with colleagues from other agencies or other countries. These have included a workshop on land tenure and the convening of an advisory group to the Leading Group of Chinese and non-Chinese specialists in rural development who will advise the Leading Group on establishing research and training priorities. In 1993, an international symposium will be held on poverty in mountain areas, and a conference is planned under the aegis of the Ministry of Agriculture to assess the lessons and impacts of the first twelve years of reform in agriculture.

At the national level, the Foundation is also helping to strengthen the capacities of leading research institutes to carry out research which generates the information needed by decision-makers to respond to key issues relating to rural poverty. This takes the form of direct support for a number of collaborative research projects and, through a two-year training programme run by the Food Research Institute of Stanford University, strategies to improve research methodologies and data analysis. Research is being carried out on

questions such as the use of poverty alleviation funding in poor counties, the linkages between poverty and environmental degradation, and the emergence of local organisations and their capacity to act as vehicles for rural development. Questions to be studied in the future include the role of labour migration in poverty alleviation, the changing role of women in agriculture, and some research comparing the experiences of India and China in poverty alleviation.

Few of the national and provincial staff charged with implementing poverty alleviation have received formal training relevant to their task, and they have very little knowledge of the experience in rural development which has been accumulated outside China. To remedy this situation, the Foundation has helped the Leading Group to organise training activities, including visits to other countries in the region and a short summer school run in China by Wye College of London University. These activities are expected to continue during 1993 and beyond with the addition of a number of fellowships to allow Leading Group staff to take the Wye College Master's Degree in Development Studies by correspondence. These students will form the nucleus of a body of trained professionals so that further training can in due course be conducted in China without the need for outside assistance.

Local Level

Major inroads have already been made into the eradication of poverty in rural China. Where poverty persists, however, it is particularly intractable, and progress has been slow. Local authorities have often implemented programmes that proved to be poorly suited to local conditions and which did not benefit the most disadvantaged households in the communities. Quite often markets for cash crops have not been assessed correctly. The Foundation supports efforts being made at the local level to design and test new approaches to poverty alleviation which address the key constraints to development and to work with farmers to adopt participatory approaches to the process of development.

In 1989, the provincial counterpart of the Leading Group in the southwestern province of Yunnan formed an informal consortium of twelve government agencies and research institutions, to carry out an innovative programme of poverty alleviation known as the Yunnan Uplands' Management Programme (YUM). With Foundation support, the consortium has carried out training activities, village level surveys, and experimental land use projects, with regular monitoring to assess the effectiveness of their work in reaching the poorest members of the communities. This programme marks a significant shift from a centralised 'top-down' model of planning to one which pays more attention to differences in natural and socioeconomic conditions between and within communities.

The Yunnan Uplands' Management programme has succeeded in identifying and implementing a number of very effective projects in some of the province's poorest and most remote villages. The provincial Leading Group now faces the challenge of drawing lessons from the process which is under way, of incorporating them into its poverty alleviation strategies, and of extending them to other areas. The Foundation will continue to offer support as the programme moves into this new phase of activity.

To strengthen the capacities of participating institutions to continue such work in the future, the Foundation has provided funding for a fellowship programme, for participants in the Yunnan Uplands' Management programme, administered by Winrock International's Asian regional office in Manila. The programme offers fellowships to fifteen students a year who are placed in courses, lasting between six months and one year, in universities and institutions in Southeast Asia, to study subjects related to rural development. Fellows are expected to continue working with YUM when they return to China.

Poverty is most persistent in resource-dependent communities in upland and mountainous areas. National, local, and household interests all converge on forest resources in particular, which are often a source of conflict. Forest conservation has long been a priority of the Chinese government, but the widespread environmental degradation which continues to afflict large areas of the country is evidence of the limitations of past reforestation campaigns based mostly on mass mobilisation.

There is a growing recognition in China that effective management of resources must be linked to improvements in the livelihood of communities or poor farmers. Provincial and local forestry authorities in many parts of the country are actively experimenting to forge such links through changes in existing systems of forest planning, adjustments to property and management rights, and new approaches to the distribution of benefits derived from forestry. This set of activities has come to be called social, or community, forestry in many other countries, although the term is not yet widely used in China.

In southwestern China, the provincial forestry departments of both the Yunnan and Sichuan provinces have joined forces with social scientists and specialists in poverty alleviation to introduce social and community forestry to a major national programme for revegetating the upper and middle Yangtze watershed, known as the Yangtze Shelterbelt Project. With Foundation support, these agencies are developing and testing more participatory models of forest management. These community and household-based management systems will bring farmers into the planning process, moving from an approach based on compulsion (primarily the use of fines and confiscation of land) to one which gives farmers an interest in planting and maintaining trees.

Although social and community forestry are not yet widely recognised terms in China, there are many experiments under way to test ways in which the local management of forest resources can be improved by sharing responsibilities and benefits more equitably between communities and the forestry administration. To encourage communication between these different projects, the Foundation also supports a national network and a newsletter on social forestry in China (in both Chinese and English) run by the information centre of the Chinese Academy of Forest Sciences in Beijing.

Poverty alleviation, upland management, and forest resources' management in China have all been hampered in the past by the limited applicability in impoverished mountainous areas of the conventional technologies for land management which implementing agencies have adopted. To broaden the range of available land-use options, the Foundation has provided funds to several of the institutions participating in upland management and social forestry programmes to allow them to document Southwestern China's rich heritage

of indigenous land and resource management systems, many of which have served their users well for several centuries. This research focusses on an assessment of how and why these systems functioned in the past? how they have changed over time? and how they could be incorporated into contemporary efforts to design sustainable upland management systems?

THREE YEARS OF THE PILOT PROJECT FOR COMPREHENSIVE DEVELOPMENT OF POOR MOUNTAINOUS AREAS IN YUNNAN PROVINCE

Project Leading Group

The pilot project for the comprehensive development of poor mountainous areas in Yunnan Province, financed under the Ford Foundation's Rural Poverty and Resources' Programme, commenced work in April 1990. The project is of a trans-disciplinary, trans-departmental, and trans-regional nature, has the sponsorship of a competent provincial department, and the active involvement of the institutions of higher learning and research institutes in the province. The initial results of the project have provided useful experiences in poverty alleviation and rural development. The "top-down" approach in poverty alleviation, which relies solely on administrative measures, is gradually being replaced by a new approach characterised by "bottom-up" and "from rural household to rural household" approaches.

1. Implementation of the Project

In the past three years, efforts have been carried out throughout the province to implement the project. The details are given below.

Establishment of the Leading and Management Bodies of the Project

In early 1990 when the project had just started, a project leading group was established, comprised of a project representative, leaders of the sponsoring and participating units, and experts. Under the leading group, a project office was established. Project coordination groups were established in pilot areas, comprised of major participating units and country leaders responsible for the organisation, implementation, and management of the project.

Investigation and Planning Work in the Pilot Areas

New rural investigation methods, such as Rapid Rural Appraisal, were used for field investigation. Multi-disciplinary teams were organised to carry out detailed studies of the pilot areas.

Implementation of the Various Projects

Since April 1990, over 80 projects have been organised in pilot areas, covering farming, animal husbandry, processing, infrastructure construction, etc. In Jiangcheng pilot area, the "slash and burn" method was replaced by sloping agricultural land technology through a project for the comprehensive improvement of hilly land, resulting in an improved agro-ecological environment and increased output per unit of land. In Guangnan pilot area, the drinking water project for people and animals has benefitted the entire population of Anwang village, basically putting an end to the problem of drinking water which had

seriously affected livelihood and production there. In Fugong pilot area, with the introduction of virus-free potatoes, potato yields improved from 250kg to about 1,500kg per *mu*, and it is expected that, in the near future, 60-70 per cent of the seed potatoes in the county will be virus-free. In Zhenxiong pilot area, under the sericulture project, over 300,000 mulberry trees have been planted on hill slopes, yielding high economic returns and preventing the exacerbation of soil erosion. All these projects have served to improve the livelihoods of local farmers and have yielded visible social and economic results.

Monitoring and Evaluation of the Projects under Implementation

In late February and early March, a monitoring and evaluation group consisting of experts from the relevant institutions carried out on-the-spot monitoring and evaluation of projects under implementation in four pilot areas. Applying new methods the team came up with timely monitoring and evaluation reports on the basis of a large amount of comprehensive and detailed data. These reports show that the implementation of the project in the first stage has been successful. With the application of rural investigation methods, such as rapid rural appraisal (RRA), the selected projects are highly suitable for the targetted areas and therefore achieved remarkable economic and social results. In terms of the distribution of projects, special attention is given to poor households. However, a few projects have not achieved the anticipated results. Our analysis shows that the main reasons for failure have been weaknesses in project management and control and insufficient consideration of technical problems.

Large-scale Training for Rural Households

Technical training for rural households in the pilot areas has always received high priority. Training has been carried out in light of the actual needs of the farmers. On-the-spot demonstrations, technical instructions, and cross-visits by farmers are the main training methods used. For typical technical problems and technologies for large-scale introduction, the training covers the whole village. For example, training in the cultivation of hybrid rice in Jiangcheng pilot area and training in the cultivation of hybrid corn in Zhenxiong pilot area involved all-round technical training of the participating farmers with on-the-spot demonstrations given by experts invited from county technical departments. For some special technologies, training focussed on a selected group of farmers. This approach to training, which combines selectivity with a general introduction, is welcomed by the farmers and has become the main approach to training rural households in the various pilot areas. In some pilot areas, farmers from neighbouring areas were brought in to pass on their skills and experiences, and arrangements were made to send local cadres and farmers to nearby areas for study tours. Such an "inviting in" and "sending out" approach to training has proved to be very effective. In order to improve the training, the provincial office for poverty alleviation has given special funds to build centres for technical and cultural activities in the pilot areas.

The Building of a Core Group for Poverty Alleviation and Rural Development

In the past few years, 12 project personnel have been sent abroad to study in universities and international research institutions in the Philippines, the United States, and

Thailand. Eight have already returned and form part of the core project staff. To meet the needs for project implementation, 14 foreign experts have been invited to China to run training courses in rural investigation methods, RRA, project monitoring and evaluation, and training of trainers. Now there is a multi-disciplinary contingent of research personnel who are mostly young, dynamic, and properly trained and who are not only working for the project but are also going to contribute to poverty alleviation in the whole province.

Organisation of Study Tours Abroad

In order to study the methods and experiences of other countries in developing mountainous areas, 15 administrative and management personnel were selected and placed in three groups for study tours to Thailand, Mexico, and the Philippines. The experiences of other countries in the implementation and management of projects for developing mountainous areas were thus applied in implementing and managing our project creatively. All this has contributed to project implementation and will contribute to poverty alleviation in the province.

Dissemination of Successful Experiences

The progress of the project has not only provided a big push to poverty alleviation in the pilot areas, but it has also exerted significant influence on poverty alleviation efforts throughout the province. The project has become increasingly popular and more and more people wish to see the pilot areas for themselves. There has also been an increasing interest in the new methods of rural investigation.

Routine Project Management

The project leading group holds regular meetings to examine and approve projects, consider their progress, and review the implementation process. Members of the leading group often go down to the various pilot areas to inspect the work and give guidance. The project office also organises field visits by experts, organises study tours abroad, and coordinates relations between the provincial departments, pilot counties, and pilot areas. To ensure smooth and steady progress, efforts are made to solicit the views and suggestions of the cadres and farmers on the work of the project.

Expanding Project Coverage

On the basis of the achievements made in the previous stage, the scale of the project will be expanded each year. Special attention will be given to the expansion of selected medium- and long-term projects. Introduction of the virus-free potato in Fugong pilot area, afforestation and soil erosion prevention in Zhenxiong pilot area, comprehensive development of hilly land in Jiangcheng pilot area, and vegetation restoration of limestone hills in Guangnan pilot area are some of the projects. Once expanded, the projects will cover wider areas, include more rural households, and need larger financial inputs. All pilot areas have made preparations in material and human resources and carried out the requisite technical training and assistance to facilitate the expansion process.

2. Useful Experiences

Establishment of a Project Management System Based on Cooperation

The pilot project for comprehensive development of poor mountainous areas in Yunnan is the first large development project for poor mountainous areas to be financed directly by an international agency. The project involves a number of disciplines and academic institutions, both at provincial and at county levels, and involves four pilot areas representing different types of agro-ecological conditions. The project has brought together leading cadres, technological personnel, and farmers to work together and share experiences. Identification of the project, organisation of the work involved, and even the management of the project are all decided upon by means of discussions, studies, and consultations among these three parties. This has contributed to the gradual evolution of a guidance and management system that is project-centred and which enjoys close cooperation and coordination from all levels. The experiences of Zhengxiong pilot area and Guangnan pilot area have been models in cooperative planning and implementation.

The "Bottom-Up" Approach to Poverty Alleviation

With the consolidation of China's Contract Responsibility System in the countryside,the old collective method of operations has been replaced by individual operations on a household basis. The old "top-down" approach to poverty alleviation, which relied solely on administrative measures, is no longer suited to the changed situation. Therefore, a new approach is urgently called for to facilitate poverty alleviation work. Over the past two years and more, through the implementation of the project, a new "bottom-up" development model for mountainous rural areas has emerged which takes into account the advanced experience from abroad as well as the natural and socioeconomic conditions of the mountainous areas in Yunnan Province. Provincial departments, local governments, various scientific research institutions, and farmers are all involved in this model. Rapid Rural Appraisal, project monitoring, and evaluation methods are used to carry out in-depth investigations and evaluations at various levels. Discussions are carried out with local cadres and farmers to identify the advantages, disadvantages, and potentials of the areas concerned, in order to decide upon the development strategy and implementation methods. This kind of development model is very effective, because it is the local farmers who know best about local conditions, and they are also responsible for implementing the projects. Without the active participation of the farmers, no project can be successful. Practice has shown that this kind of "bottom-up" approach, which places emphasis on the active participation of local farmers, is an effective, more rapid, and sustainable path to rural development.

Changes in Decision-making Procedures and Management Functions

Along with the introduction and implementation of new concepts and new methods of rural development, the impetus has been created to change the decision-making process and project management functions of the relevant authorities. During implementation of the project, the project leading group abandoned totally the old centralised project management and decision-making procedures. Instead, discussions were carried out among rural households involved in the pilot project, cadres, local leaders, and the

sponsoring unit. They studied the situation together, planned out programmes together, designed specific items for the projects, and organised the actual collective implementation. The leading group only undertook the responsibility for examining and approving the project and monitoring its implementation. The organisation and management were left in the hands of the county coordination group and the sponsoring unit. These new decision-making and management procedures not only helped to motivate the enthusiasm of governments and people at various levels, in various departments, and in rural households, but also enabled the leading group to give more attention to overall guidance and provide the necessary services for the project. More and more leading cadres have realised the advantage of this kind of decision-making and management process. The new procedures are used as one of the main contents in the training of provincial leaders in the field of poverty alleviation.

Promoting Participation and Scientific and Technological Awareness in Rural Households

The implementation of the project has helped change the old ideas of rural households about relying solely on government assistance. The scientific and technological awareness of rural households has also been greatly enhanced. More and more rural households wish to and actively take part in all kinds of scientific and technological training courses. Their horizons have been broadened by the project. They are no longer satisfied with operating their own households, they want to participate in the construction of infrastructure in their villages. For instance, the households in Guangnan pilot area contributed their labour to build roads and drainage facilities and plant trees in order to improve the appearance of their villages. The households in Jiangchen pilot area voluntarily contributed labour and timber to build a scientific and cultural activity centre. In Zhengxiong pilot area, the households pooled funds to build road and electricity facilities with the help of the county and township governments. In Fugong pilot area, rural households participated enthusiastically in the construction of a training centre.

Coordination between Scientific Research and Administration

Implementation of the project has provided an opportunity for administrative departments, scientific research institutions, and colleges to establish close contact, discuss together the development and poverty alleviation strategies for the province, and explore and experiment with new methods and approaches to poverty alleviation and development. Such coordination has opened the door to direct cooperation between administrative departments and scientific research. In Zhengxiong pilot area, the local government and the provincial academy of forestry cooperated to experiment with and disseminate new technologies for increases in grain yields. In spite of natural calamities, the area successfully increased their grain output by 20 per cent over the same period last year. Successful coordination between science and technology and administration has helped many successful experiments. For instance, in Guangnan pilot area, a new technology has been introduced to store drinking water in a pond. About 20 to 30 per cent of the rural labour force has been freed from the burden of fetching water each day, and the problem of drinking water for men and animals in Anwang village has been solved. In Jiangchen pilot area, scientific methods have been used to experiment with early corn crops. This has resulted in the increase of corn yield from 400 or 500 to over 1,270 *jin* per

mu. At present, farmers in that area can reap two crops a year instead of one. In Fugong pilot area, the introduction of virus-free potatoes has increased the potato yields from 250kg to 1,500kg per unit of land.

3. Future Plans

Due to the great efforts and large amount of work carried out over the past three years, noticeable results have been achieved and useful experiences gained. However, it is only natural to encounter various difficulties. The problems of ensuring the feasibility of scientific work, of disseminating successful experiments on a wider scale, and of strengthening project management have to be addressed. Local governments and the relevant departments in the field of poverty alleviation, as well as villages and townships in the pilot and demonstration areas, have a greater responsibility in this respect. Close cooperation with the sponsoring and participating units is imperative, since these are the backbone of the entire project.

In the process of proposing, evaluating, identifying, and implementing the projects, it is necessary to make full use of the effective investigation methods and understand the views of local rural households.

Greater importance needs to be given to women's participation in the projects. More women should be included in both technical training and project implementation, and full account should be taken of their requests and interests. In the future, every county project coordination group should have two or three female members. This objective should be a mandatory target of the pilot areas.

Owing to the combined efforts of all the people concerned, noticeable results have been achieved in the work of the projects and many useful experiences have been learned. However, there are still short-comings that need to be overcome.

POVERTY ALLEVIATION THROUGH WATERSHED MANAGEMENT IN MOUNTAIN AREAS:

The Case of the Xiaojiang Watershed, Yunnan Province

Li Tianchi
Yang Wenke

1. Introduction

Hill slope lands in the drainage region of the Xiaojiang River of Yunnan Province, south-western China, have been highly degraded by deforestation, erosion, landslides, and debris flows. The purpose of this paper, in this context, is to:

(a) examine the historic events that contributed to the present scope and magnitude of the degraded land problem;

(b) assess the role of various hill slope processes in the formation of degraded lands; and

(c) discuss the measures being taken to rehabilitate degraded lands in the watershed and to improve the living standards of the local people.

2. Physical Conditions of the Xiaojiang Watershed

The Xiaojiang River in northeast Yunnan Province flows northwards 138km from Chengdu Lake to the Jinsha River (Chinese designation for the upper Yangtze River along the southern border of Sichuan and north Yunnan). With a drainage area of 3,040sq.km, the Xiaojiang River has 61 first-order tributaries, 51 of which are subject to landslides and debris flows. Landslides and debris flows occur most frequently in the middle and lower reaches of the drainage in the Jiangjia, Daqiao, Laoga, Dabaini, Xiaobaini, and Heishui tributaries.

Elevations within the drainage basin range from approximately 700m in the lower extremity of the Xiaojiang River Valley to at least 4,500 m in the upper watersheds of the tributaries. The topography is relatively flat in the wide Xiaojiang River Valley and along the lower parts of tributary streams. Relative altitudinal difference in the upper parts of tributary valleys exceeds 2,000m; slopes are long (600 to 1,000m); and some are very steep (35° to 50°).

The Xiaojiang River region has distinct wet and dry seasons. Rainfall during monsoon season from May to October accounts for 85 per cent of the total annual precipitation. Average seasonal rainfall increases rapidly with the rise in altitude from 680mm in the Xiaojiang River valley to 80mm in the low and middle mountains and to at least 1,200mm in the high mountains.

Precambrian dolomite and shale; permian basalts and volcanic breccia; and lacustrine deposits of clay, silt, and sand are the principal geologic units. Tectonic movements have folded, faulted, and strongly sheared the rocks. Where bedrock is exposed, it is usually weak, weathered to depths of at least 100mm in some watersheds. The deeply weathered bedrock is very susceptible to erosion and landslides (Li 1980).

The region displays three broad vegetation zones. In the Xiaojiang River valley, where the climate is hot, the vegetation cover is mostly sub-tropical savanna shrub. At low and middle elevations, the mountains have some pine and oak forests; fir trees predominate at high elevations. Sugar cane, maize, and rice are the main agricultural crops of the Xiaojiang River Valley and the surrounding low and middle mountains. Goats graze throughout the region, particularly on steep slopes.

3. Hill Slope Land Degradation

In ancient times, the watershed region of the Xiaojiang River was covered with green hills, dense forests, and clean water. Timber harvesting began in the region as early as the Tang Dynasty (618-907 A.D.). During that period, deforestation was probably limited to small isolated areas. However, 300 to 400 years ago (1580-1680 A.D.), during the late Ming or early Qing Dynasty, charcoal production for the smelters of the burgeoning copper industry resulted in massive deforestation. Timber harvesting continued until 1949. By that time virtually all the forests had been cut in many of the tributary watersheds of the Xiaojiang River (Chen et al. 1981; Zhao 1983; Wieczorek et al. 1987).

Erosion and Landslides in Upper Watersheds

The sloping lands in the upper parts of the Xiaojiang River were affected first by the rapid incision of gullies and downcutting of ravines in upland terraced areas after deforestation. These rapid incisions, facilitated by increased runoff from the denuded watershed, led to over-steepened channel sides prone to instability. During intense storms, high runoff incorporated loose material from rockfalls and shallow debris; these blockages were subsequently breached catastrophically during periods of high runoff, causing great disasters in the valley of the Xiaojiang River.

In the upper part of the Duozhao branch of the Jiangjia ravine of the Xiaojiang River, local farmers report that, 300 to 400 years ago, terraced surfaces extended across this upper valley. About 200 years ago, the terraces were no longer continuous because the incision of deep gullies had begun. Later, gullies cut deeper and enlarged laterally into ravines. A large village was forced to move from the edge of the encroaching ravine. Owing to rapid incision and lateral expansion of the ravines, caused by erosion and shallow landsliding, several other smaller villages were also forced to move.

The rate of erosion in these upper watersheds is illustrated by recent measurements. Gully incision in 10 of the various branches of the Jiangjia tributary averaged from 0.2 to 0.5m/yr during the period from 1957 to 1973 and downcutting of as much as 8-10m was measured at individual sites during exceptional events. With these rapid rates of

downcutting, the development of such deeply-incised channels during the last 300-400 years is plausible (Wieczorek et al. 1987).

Sedimentation in Lower Watersheds

Some 200 years ago, five villages, along with sugarcane pressing mills, inns, and prime agricultural land used for cultivating sugarcane and peanuts, were situated on the alluvial fan of the Daqiao river. This location was the principal commercial centre for the region's towns. A clear river flowed through a bush and tree-covered ravine, five kilometres long and 50-60m deep, incised into the fan. Large-scale debris flows burst out of the Daqiao ravine in 1833, 1855, 1877, 1905, 1919, 1933, 1949, and 1954, and smaller flows occurred almost every year. Eventually these flows filled the ravine in the fan and buried the five villages. During the last 100 years, approximately 150m of deposits have accumulated on the fan near the junction of the Daqiao and Xiaojiang rivers. There are other instances of alluvial fan formation and aggradation in the lower reaches of the ravines.

Historically, land degradation associated with erosion and sedimentation, appeared first in the upper watersheds, followed by effects in the lower watersheds. This sequence parallels the geomorphic process of erosion of materials -- transport from ravines of upper watersheds to deposition and fan building on lower watersheds. In the upper and lower watersheds, the net effects were similar - communities and prime agricultural lands were severely damaged, forcing occupation and cultivation of less desirable sites away from available water supplies.

4. Poverty Alleviation through Watershed Management

The importance of ecologically stable mountains, in particular for agriculture and human settlements in the watershed of the Xiaojiang River, has been recognised at the provincial and national levels. To reduce the damage from debris flows and landslides, as well as to rehabilitate the degraded hill slope lands in the drainage region, several comprehensive control projects were designed and undertaken from 1975 to 1990. They were based on studies of the mechanisms of debris flows and landslides, the natural process, and the types of damage. The projects were funded by the Government of Yunnan Province and undertaken by the Institute of Debris Flow Prevention of the Dongchuan and Chengdu Institute of Mountain Hazards and Environment in collaboration with the local governments and communities. The comprehensive control projects of the Dachao River and the Heishui ravine in the Xiaojiang River basin are good examples of poverty alleviation through environmental management.

The Dachao River Watershed Management

The Dachao' River is a major tributary of the Xiaojiang River with a drainage area of 53.1sq.km. Within the basin the mountains are high, the valleys are deep, and the slopes are steep. Fifteen years ago, the vegetation was sparse and the land was bare. There are many landslides on the slopes in the middle reaches of the Hunshui Ravine. During intense storms, high runoff from the landslide areas mobilised the loose materials into debris flows, causing great disasters in the river's lower reaches.

In the upper watershed, 5,300ha of slope land were reforested and 20ha of slope farmland were terraced. At present, forest land and grass land occupy 85 per cent of the cultivable land in the watershed. In the main ravine of the middle watershed, eight silt-retention dams, 89.5m high, were constructed with a silt storage capacity of 1.56 million cm. These structures are concrete gravity checkdams with foundations usually excavated into bedrock. They are constructed with drainage pipes at various heights and with a low-flow centre section. In the lower part of the watershed, on the vast depositional fan, an artificial channel, 10 to 15m wide, 5,000m long, and 2.4m high has been constructed to prevent flooding and to discharge debris flow into the Xiaojiang River.

This comprehensive control project of the Dachao River was completed in late 1979. The project cost was 1.44 million *yuan*. Since 1980, there have been no disastrous debris flows. The economic and ecological benefits from the project are as follows:

- protection of 89ha of cultivated land and reclamation of 246ha of marginal land in the lower watershed;
- a decrease in sediment yield by 90 per cent of that in 1975;
- an increase in grain output by 70 per cent over that in 1975;
- grain per capita in 1990 was 380kg, an increase of 105 per cent over 1975; and
- per capita income in 1990 was 636 *yuan*, an increase of 835 per cent over 1975.

The Heishui Ravine Watershed Management

Heishui Ravine, another tributary of the Xiaojiang River, has a total length of 3.95km and a drainage area of 9.94sq.km. The vegetation cover was seven per cent of the total catchment in 1982. In the 1970s, debris flows destroyed farmlands and threatened one school, a water conservancy project, and the Kunming-Dongchuan railway and highway which run through the lower watershed.

In the upper watershed, 133ha of slope land were reforested and 15ha of sloping farmland were terraced. At present, forest land occupies 32 per cent of the watershed and the total vegetation cover occupies 70 per cent of the watershed. In the main ravine of the middle watershed, four silt-retention dams, 35m high, were constructed with a silt storage capacity of 0.4 million cm to help stabilise landslides. A 780m trench drain and a 1,450m artificial channel have been constructed to prevent flooding and to discharge debris flows into the main river.

The watershed management project was started in 1983 and completed in 1990. The project cost was 1.05 million *yuan*. The economic and ecological benefits from the project are:

- protection of 53ha of cultivated land and reclamation of 13ha of marginal land in the lower watershed;

- total grain output in 1990 was 0.316 million kg, an increase of 152 per cent over that in 1982;
- grain per capita in 1990 was 285kg, an increase of 137 per cent over that in 1982; and
- per capita income in 1990 was 449 *yuan* RMB, an increase of 534 per cent over that in 1982.

Lessons Learned

(a) Historically slope land degradation in the watershed area is believed to be attributable largely to deforestation. Following deforestation, other factors, such as the weak geologic materials, high-intensity storms, and high seismicity undoubtedly played a role in landslide debris flow processes.

(b) The key part of the watershed management programmes was to build a series of checkdams to reduce sediment discharge by arresting debris from landslide areas; to stabilise landslides and potential slope failures by back siltation behind the dam; and to prevent downcutting of the ravine bed by arrested sediment.

When the dams are filled, the local stream gradient is decreased and the basement of the valley slightly widened. However, once a group of checkdams along one tributary has filled, additional retention of material within a ravine is limited unless the heights of the checkdams are raised or unless material is removed. Thus, if a large supply of debris is still entering the channel, the effectiveness of a series of checkdams is only partial and temporary. Therefore, a comprehensive programme using reforestation to control soil erosion is necessary in addition to the construction of the checkdams. Trees generally are well established and begin to act effectively to control erosion in the area within 10 to 15 years.

(c) Watershed management in landslide/debris flow prone areas can be successful only when such efforts are based on a full understanding of the landslide and debris-flow processes. In such areas, degradation of watersheds can be arrested by a package comprised of afforestation, engineering structures, etc. The costs of stabilising landslides and controlling debris flows are very heavy, yet the ratio of benefit/cost is quite significant.

(d) In the rural mountain areas of China, the required funds for managing watersheds may have to be met mainly by the government and, in part, by credit institutions and beneficiaries. Beneficiaries can contribute in the form of labour and local materials such as boulders, plant materials, etc. But even labour by the beneficiaries cannot be completely free, as they need wages, in part at least, to meet daily needs. Contributions from beneficiaries are necessary for faster implementation of the programme and to transform it into a people's movement.

(e) A need exists to develop grassroots' level organisations that can help in planning, designing, building, and implementing a watershed management programme.

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THE WANGDONGGOU WATERSHED DEVELOPMENT MODEL (WGWDM) ON THE LOESS PLATEAU

Li Yushan

1. Introduction

The Loess Plateau lies in the hinterland of China and has an average elevation of 1,000 metres. It is an area with the highest soil loss in the world. The annual soil loss reaches 1.6 billion tonnes because of hilly landform, intensive rainstorm, and loose loess material and especially because of excessive land reclamation and overgrazing. As a result, soil is seriously degraded, land productivity has greatly decreased, and the area has become one of the poorest hill areas in China. In order to improve the ecology and environment of the Loess Plateau, an initiative was first taken in the National Seventh Five-year Plan. Establishment of the Wangdonggou Watershed Development Model (DMWW) is one important achievement of this programme.

Wangdonggou watershed, in Changwu county, Shaanxi Province, has a typical plateau-gully landform, covering an area of 8.3 square kilometres. The DMWW objectives are land resource conservation and soil loss prevention as well as an overall land productivity increase.

2. Characteristics of the Wangdonggou Watershed

The watershed is 4.9km long. The northern plateau is 1,226m in elevation. Intensive gully erosion characterises 65 per cent of the area. The gully density is 2.9km/km^2. The sloping area accounts for 2/3rds of the area of the watershed, of which land over 15° in steepness accounts for 58.4 per cent and that over 25° is 41.2 per cent.

Erosion in the watershed is mainly slope erosion, gravitational erosion, and gully head regressive erosion. The major challenge to land development and land use is to facilitate soil conservation through terrace building, gully slope afforestation, and overland flow trapping, as well as gully head checks, etc.

The area has 584mm annual rainfall, a 9.1°C mean annual temperature, and falls into a semi-humid region with suitable moist-thermal conditions. The soils are mainly loess which has loose and deep layers with good infiltration and moisture-holding abilities. It has favourable ecologic properties for deep growth of root systems. However, the soils have low organic matter content, only 1.056 per cent on average, with a minimum of 0.355 per cent. There is also low available nutrient content. Over 36 per cent of the land has available phosphorous below five ppm, and thus the land is very sensitive to nitrogen and phosphorous fertiliser. Owing to infertility, farmland productivity is very low. The grain yield was only 72kg/*mu* (1,080kg/ha) before 1972, it was 116kg/*mu* (1,740kg/ha) during 1971-1980, and 168kg/*mu* (2,520kg/ha) in 1981-1987.

Wangdonggou watershed has a total of 12,450 *mu* (830ha) of land. A little over forty per cent of the land is 5th to 8th class land. The population density is 22 persons/km^2. Grain crops cover 86 per cent of the 1st to 3rd class land in dry farming agriculture. Per capita grain availability is 350kg. With population increase, land per capita has fallen below 1.6 *mu*. Increasing grain yields and extending multiple cropping areas are the only two ways of increasing grain production.

Before 1980, grain contributed 75-80 per cent; fruit, forestry, and livestock less than 10 per cent; and sideline activities about 10-15 per cent of the total income. Landscapes were characterised by low yield farmlands, waste slopes, and gully conservation forests. Inputs to farmland were very low. Traditional agricultural practices ignored crop diversification and productivity remained very low.

Based on these conditions of the Wangdonggou watershed, the development policy adopted was to promote overall land productivity by increasing output on the plateau and by conserving soil and water through the proper management of gully slopes.

3. Structure and Function of the DMWW

Structure and Function of the DMWW

The DMWW is presently a land development model. The aim is both to raise land productivity maximally and also to prevent land degradation from erosion. According to ecological conditions and economic potentials the land was categorised into different types. The first type is plateau land, mainly used for grain cropping, and the second type is composed of platform land and terraced fields with ridged land systems, used mainly for fruit planting and also for grain. Of the third type, the better areas were used for afforestation and the poor, steeper areas were used for conservation forestation. Farmland took up 33 per cent and forest land up to 44 per cent of the total area.

Grain, economic crops, fruit trees, and forestry are integrated in the system of land use advocated by the DMWW. The target in grain production is to attain the regional potential of 5,000-6,000kg/ha. In fruit production the area is being developed as a national apple production base, as a principal income source for farmers. Forestry is mainly for ecological conservation.

Table 1: Variations in the Economic Ecologic Index in Wangdonggou Watershed

Item	Unit	1986	1990	Increase (%) Decrease
Unit area grain yield	kg/ha	2734.5	5250	92.0
Grain per capita	kg	347.4	550.2	58.4
Income per capita	*yuan*	230.5	508.0	120.4
Forest coverage	%	18.2	32.1	76.4
Erosion modules	t/km^2	1860*	894.6*	-51.9

* Mean in 1981-1985 and in 1986-1990 respectively

Benefits of the DMWW

The DMWW has been in operation for five years. By 1990, great changes had taken place in grain yield, grain availability per capita, income per capita, forest coverage, and sediment flow (Table 1). Because of improvements in basic facilities and conditions, increase in inputs and extension of advanced farming techniques, production has increased very rapidly. By 1992, income per capita reached 300 *yuan* per annum from apple production alone.

4. The Economic/Ecological Effects of the DMWW

Increases in Grain Yield

As a result of the DMWW, the wheat yield in 1989-1990 reached 4.4T/ha, about 82.2 per cent of the maximum yield. Maize reached the maximum yield. In spite of decreases in grain cropping area per capita to 1.6 *mu* (0.1ha), there was an increase in grain production per capita.

The experimental data suggest that nutrient deficiency is the principal factor influencing grain yield in the area at present. The water factor is also somewhat deficient. Quantitative analysis showed that the decrease in grain output was about 11 per cent due to water deficiency and about 43 per cent due to nutrient deficiency. Certainly fertiliser increase is the most important factor in improving grain yield.

Manure is the best fertiliser in Chinese traditional agriculture, and supply of manure is almost constant. Therefore, the main way to increase nutrient input is to increase chemical fertiliser input. The amount of N and P_2O_5 used in grain cultivation was the 64.5kg/ha in 1986. It increased to 178.5kg/ha in 1990. Increase of nutrient inputs raised soil moisture use efficiency of crops by 79.6 per cent. Average annual water use increased from 68.2mm to 147.8mm for stored water in the soil. Water use efficiency was obviously raised, that of wheat increased from 0.37kg/mm to 0.76kg/mm, and that of maize from 0.79kg/mm to 1.09kg/mm. Thus, higher grain yields could be obtained under similar field water supply conditions as before by better inputs and land management.

Development of Low Class Lands on Gully Slopes

The gully slope system has two land types, i.e., ridge and gully, accounting for about 65 per cent of the total area. These land types are not only poor but are also a main source of sediment. The farmers living here are very poor. The income per capita is below 200 *yuan*. It is therefore strategically important to develop gully slope lands.

Since the implementation of the Wangdonggou Watershed Gully Slope Development Model (WGDM), land productivity has risen very rapidly.

From 1986 to 1990, grain yield increased by 207.3 per cent, grain per capita by 160.6 per cent, and income per capita by 237.3 per cent. This development speed has great demonstration effect for poor hill areas. Construction of slope orchards completely

changed the situation of low class land. The first apple orchards were established in the autumn of 1986. By 1992, apple yields had reached 24,120kg/ha with a total output of 215,400kg, worth 0.388 million *yuan*.

The WGDM consists of three basic activities and three industries. The former consists of engineering of the gully slope road, land levelling, and potable water work. The three industries are grain and economic crops, orchards, and forestry, of which orchards are the main industry. Land type and distance from the village influence land use.

Road construction has guided watershed development. Commodity circulation, material transportation, extension and information exchange, and education all require a road network. By 1990, the road development was complete in nine development units of gully slope in the watershed. Erosion prevention is an important concern in road construction, otherwise roads would be a source of new sediment. Road design principles included overland flow, short runoff paths, and plant vegetation. Erosion proof techniques of road construction have proved to be very successful.

Land levelling work included conversion of sloping farmland into level terraces. Sloping land over 25° was fully built into bench terraces two to three metres wide, part of which is used for orchards. The potable water work ended the historic drudgery of carrying water. Land levelling contributed to increased outputs and yields. Steep slopes of over 25° were devoted to forests.

With the implementation of the WGDM, a highly efficient agricultural ecological system was realised which directly contributed to poverty alleviation.

Land Resource Conservation and Soil and Water Loss Prevention

Protection of land resources from erosion damage is one of the two principal goals of the DMWW. By land levelling; gully head protection; erosion-proof work on sloping roads; strengthening of water cycles on farmland; and increased vegetation, runoff and sediment yields in the Wangdonggou watershed were reduced remarkably. Soil erosion decreased from 1,860T/km^2 to 294.7T/km^2 already, between 1986 and 1990.

Besides these conservation measures, use of erosion-proof techniques in slope roads and tapping of runoff from villages and roads to develop water pools in each village contributed to effectively protecting the plateau from dissection by gully head regression.

5. Conclusion

The DMWW is a land development model efficiently combining soil and water conservation with agricultural development on the loess plateau. With this model, land resources are conserved effectively, land deterioration is prevented, land output is raised substantially, farmer's income has more than doubled, and the environment has improved appreciably. Therefore it has proved to be an effective method of land management and sustained agricultural development.

THE SMALL WATERSHED MANAGEMENT PLANNING METHOD

Wang Lixian
Hong Xiying
Xie Baoyuan

Introduction

Control of soil and water loss and protection and rational use of soil and water resources are essential measures for changing the landscape and establishing a favourable ecological environment in mountainous and hilly areas. They are also important measures for land reclamation.

In May 1982, on the basis of our research on the classification of small watersheds (torrents) in Beijing mountainous region, we worked out "detailed procedures of investigation for torrent classification in the rocky mountainous regions of north China". After that, to meet the needs for comprehensive investigation of soil and water loss in small watersheds in the Haihe Valley and the Beijing mountainous region, we also worked out "detailed procedures for the comprehensive investigation of soil and water loss in the small watersheds (torrents) in the Beijing mountainous region". These were adopted by the Working Group of Soil and Water Loss in Haihe Valley in 1982. Following these procedures, until now, investigation of soil and water loss and management plans have been completed for about two hundred small watersheds in key regions of the Haihe Valley and in more than 4,000sq.km. of the Beijing mountainous region. In March 1984, at the request of the Working Group for Planning Soil and Water Conservation in the Loess Plateau, "detailed procedures for investigation of soil and water loss in the Loess Hill Gully Region" were also worked out.

To improve the quality and the efficiency of such investigations, the application of an information management system to a land resources' inventory and to small watershed management planning was also studied. This paper discusses the methods for such planning.

Method

The Concept of the Small Watershed

There is no standard concept of small watersheds. In the U.S., catchment areas of less than 1,000sq.km. are regarded as small watersheds, whereas in European countries the term refers to areas of less than 50-100sq.km. The soil and water departments in China generally describe small watersheds as catchments of less than 30sq.km.

Characteristics of the Land Resources' Information Database for Small Watersheds

The information database for land resources in small watersheds involves the following.

(a) Drawing the boundary line of the small watershed, and then dividing the small watershed into land blocks. The number of every block (6 digits per number) includes the number of the small watershed and other pertinent information.

(b) The information database should include not only the factors that affect the potential productivity of land, such as rock, soil, slope, plant cover, the type and degree and intensity of erosion, etc, but also the information about soil and water conservation measures in every land block.

Purpose of the Information Database for Land Resources in Small Watersheds

The main purposes in setting up an information database for small watershed land resources are to (a) create a database to facilitate establishment of a comprehensive management plan for small watersheds; (b) supply requisite information for preparing land use plans, as well as soil and water conservation measurement programmes in the watersheds; and (c) provide information that can be shared by relevant agencies (agriculture, forests, animal husbandry, water conservancy) concerned with the management of land and water resources.

Structure of Information

The information database uses the data file to store the information. The data file is composed of records that have the same structure, every record includes some sub-records. Some factors in land resource investigation, such as soil, can be a sub-record item. The information database of the Qing Shui He Basin in the Men Tou Gou division of Beijing has 48 sub-records.

The land block number is used as the key word of the record. The block area under investigation must be more than 0.01sq.km. The block boundary is determined by aerial photo interpretation.

A data file includes the entire records that correspond to the whole blocks belonging to several communes. All the data files in our information databases use the direct file organisation.

Data Dictionary

In order to enter the investigating factors into the computer, every factor is symbolised with a code. All of these codes form a data dictionary of the information database. Working out a data dictionary is the important basis for building up an information database on a small watershed. Elementary items corresponding to the sub-record data in the information database include types of rocks, soil, slope, plant cover, erosion, and land (including land use).

File Management System of the Information Database

The management system is based on the following software and hardware components.

- A CCS microcomputer (the minimum internal storage for the user is 15k)
- An OASIS operating system (8 inch diskettes and a rigid disk drive are used for external memory)
- The number of records in a file is according to the capacity of the diskette and rigid disk:
- the maximum number of characters in a record is 256,
- the maximum number of subrecords in a record is 32, and
- the maximum number of characters in a subrecord is 8.

The information database makes it convenient to increase, delete, modify, display, and print the data.

One can continuously enquire and retrieve multiple items and values in two dimensions at the same time, that is, two files can be opened at a time to retrieve queried values of one or more group items. After querying the two files, retrieval can be repeatedly carried out on other files.

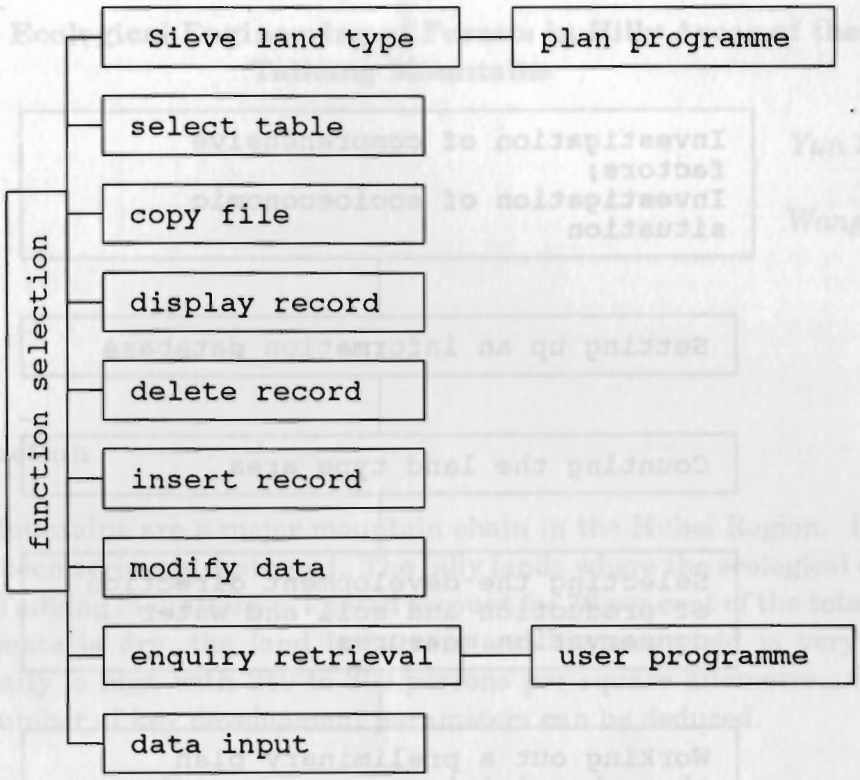
- To use the results of retrieval, the user can link it to his own programme.
- The user can select the table forms they need, or use their table programme for outputting the results.
- The user can work out a plan for land use and a measurement programme for soil and water conservation in a watershed, commune, administrative division, or county.

A flow chart on planning with the information database is shown in Figure 1 and a flowchart of planning with the database is given in Figure 2.

Concluding Remarks

The combination of information database techniques with remote-sensing techniques can greatly improve the quality and efficiency of the planning work of soil and water conservation. Compared to traditional methods, remote-sensing techniques help improve the accuracy of investigation, greatly cut down the amount of field work, increase the speed of investigation, and reduce working costs by about one half. In comparison with traditional methods, the information data base speeds up enquiry considerably.

Figure 1: Structure of the Information Database



A great deal of information from the database can be supplied to users in agriculture, forestry, animal husbandry, etc. The computer can offer more than 50 thousand statistical tables of derived data items to meet the varied needs of the user.

Acknowledgement

The authors would like to thank Professors Guan Jun-wei and Han Xi-Chun for their helpful suggestions.

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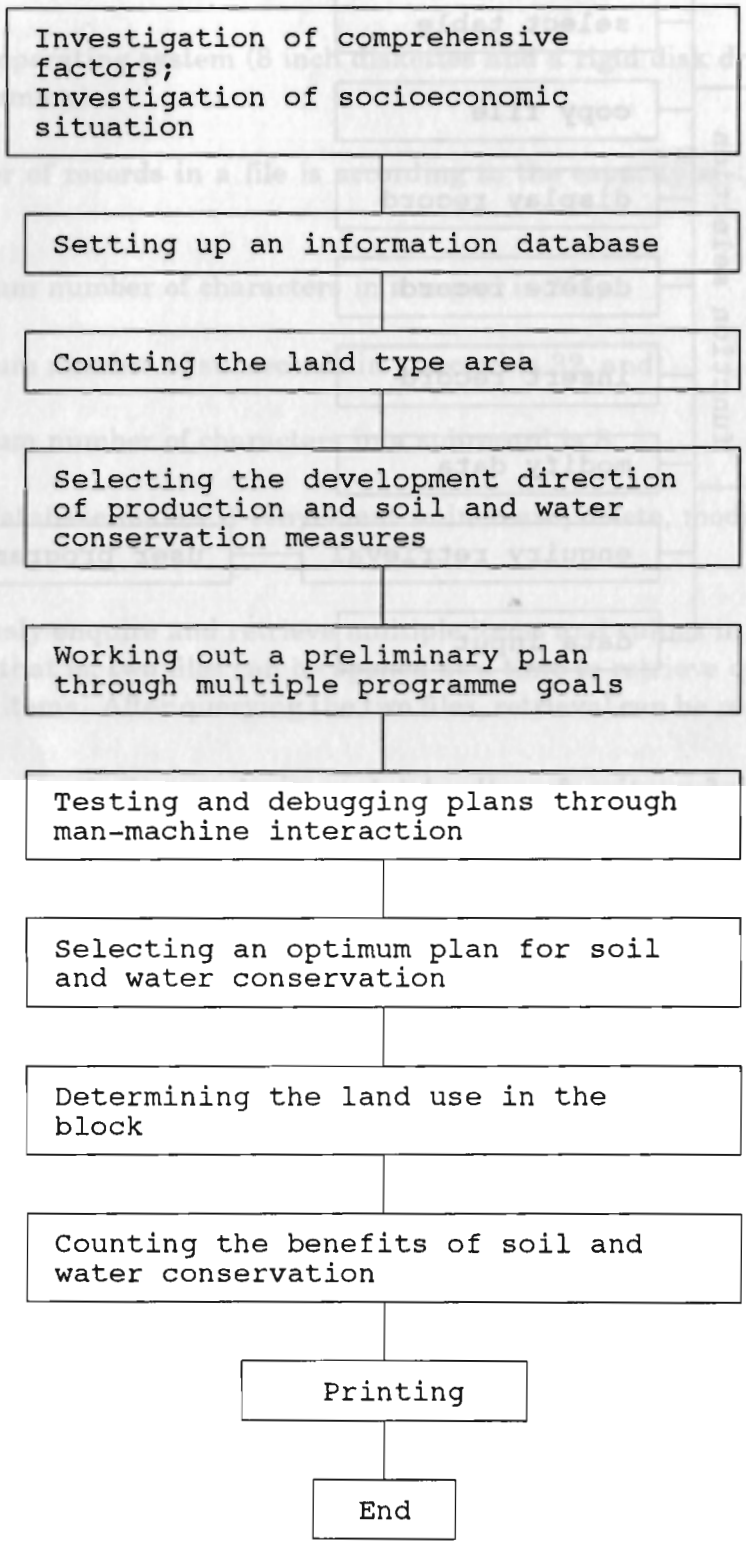
Figure 2: Flow Chart of Planning with the Information Database



THE APPLICATION OF ECOLOGICAL ENGINEERING IN FORESTRY CONSTRUCTION IN A POOR MOUNTAIN AREA

The Ecological Engineering of Forests in Hilly Areas of the Taihang Mountains

Yun Zhengming
Gao Fucun
Wang Zhendong

1. Introduction

The Taihang Mountains are a major mountain chain in the Hubei Region. In this area vegetation has been seriously destroyed. The hilly lands where the ecological experiment station for the Taihang Mountains is located account for 70 per cent of the total mountain area. The climate is dry, the land is barren, and biomass yield is very low. The population density is high with 240 to 300 persons per square kilometre. Given these conditions, a number of key development parameters can be deduced.

(a) Vegetation types in the hilly areas of the Taihang Mountains are predominantly grasslands or sparse forests and shrubs. It is difficult to form a forest community on the hilly land where the average annual temperature is less than 13°C and the annual rainfall is less than 800mm.

(b) This is a seriously degraded mountain area with a long history of vegetation destruction. Only by artificially slowing down the cycle of vegetation removal and replacement (positive succession) can the ecological environment of the mountain area be improved.

(c) The renewal of plant cover should be brought about by means of reconstructing an artificial forest ecosystem instead of an artificial forest community, the artificial plant cover being stable and highly efficient.

(d) The hilly area is a fragile and active ecotype. By means of applying adaptable species and a rational structure to the reconstruction of the ecosystem, it is possible to increase productivity and improve the environment in a short time.

Based on the features of the Taihang Mountains mentioned above, the guiding philosophy was the establishment of a "multi-layered green plant cover through increasing the conversion of solar energy; modifying strategies according to local circumstances; slowing down the process of vegetation regeneration; combining soil conservation with soil improvement; applying complementary biological and engineering measures; integrating grasses shrubs and trees; integrating economic and timber forests; reforestation combined with poverty alleviation; promoting mutually complementary economic benefits and ecological benefits; encouraging complementary management practices for low hills, gullies

and ravines; integrating forestry, animal husbandry, and general agriculture; water conservation and water saving; integrating short- and long-term objectives, research, and utilisation". The principle now being advanced in the hilly areas of the Taihang Mountains is "self-supporting plantation, commodity economy-oriented fruit tree plantation and animal husbandry, ecological protection, and cure of plant diseases and insect pests".

2. Major Components of the Projects

According to the guiding philosophy and overall arrangement mentioned above, the project is based on the following measures.

Investigation of the Experimental Region and Project Designing

By means of aerial photographs combined with detailed investigations on the ground, all the soil-forming rocks, soil layer thicknesses, soil structure, soil moisture, soil nutrients, slope formations, and current vegetation were identified. Designs were made for integrated forest engineering based on the current topographical map and background data investigated in the experimental region.

Use of Practical Techniques of Afforestation

Practical Afforestation involved the techniques of matching different populations, introduction of advanced seedling propagation techniques, use of soil conservation techniques, and enhancement of soil fertility by planting high yield economic forests.

Investigation of Insect Fauna and Use of Comprehensive Protection Techniques against Insect Pests with Stress on Bio-control in the Demonstration Area

The research work also included the use and development of plant resources in mountain areas, investigation on the flora and biomass, and monitoring of the ecological environment.

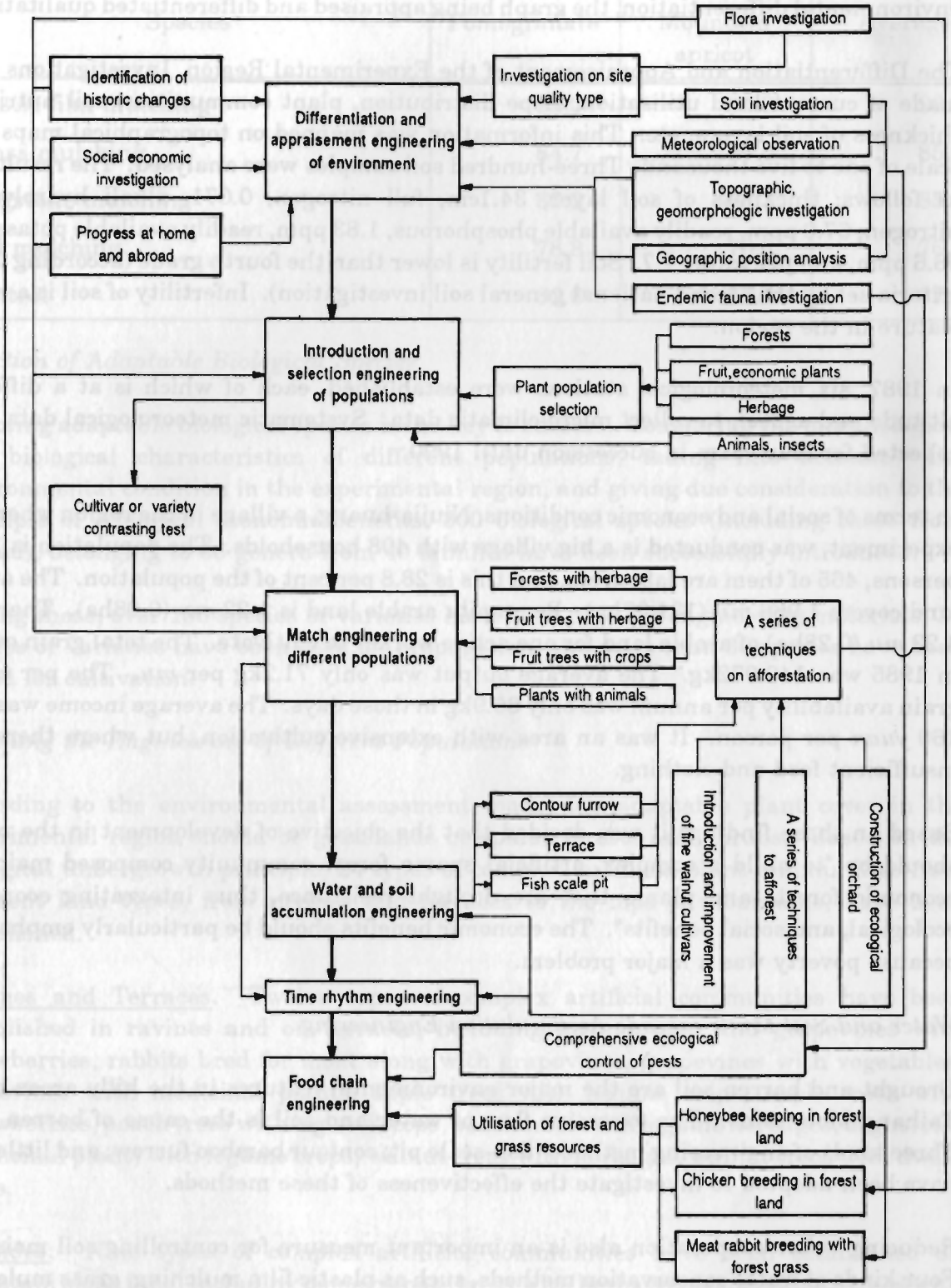
3. Progress of the Research Project

The research started in 1986 and is still continuing. A theoretical system and models of forest ecological engineering have been related. These include six sub-engineering aspects (Figure 1).

Differentiation and Appraisement of the Engineering of the Environment

First, it is necessary to differentiate and appraise the environment of ecological forest engineering. The environment can be divided into the natural and social environment.

Figure 1: Systematic Scheme of Multi-dimensional Forest Engineering



The Differentiation and Appraisement of the Macro-environment. The hilly area of the Taihang Mountains is a transitional zone from the mountains to the Haihe River plain. Twenty-five indices were used to compile and draw the appraisement graph of macro-environmental differentiation, the graph being appraised and differentiated qualitatively.

The Differentiation and Appraisement of the Experimental Region. Investigations were made of current land utilisation, slope distribution, plant communities, soil nutrients, thickness of soil layers, etc. This information was mapped on topographical maps on a scale of one to five thousand. Three-hundred soil samples were analysed. The results are as follows: thickness of soil layer, 34.1cm, full nitrogen, 0.071, alkali hydrolysable nitrogen, 67.0 ppm, readily available phosphorous, 1.83 ppm, readily available potassium, 98.6 ppm, and pH value, 7.7. Soil fertility is lower than the fourth grade (according to the criteria set by the second national general soil investigation). Infertility of soil is a major feature in the region.

In 1987, six meteorological stations were established, each of which is at a different altitude and aspect, to collect micro-climatic data. Systematic meteorological data were collected for four years in succession until 1990.

In terms of social and economic conditions, Niujia-huang, a village in the region where the experiment, was conducted is a big village with 408 households. The population is 1,612 persons, 465 of them are labourers, and this is 28.8 per cent of the population. The arable land covers 1,966 *mu* (131.07ha). Per capita arable land is 1.22 *mu* (0.08ha). There are 4.23 *mu* (0.28ha) of arable land for one active worker to cultivate. The total grain output in 1985 was 140.072kg. The average output was only 71.2kg per *mu*. The per capita grain availability per annum was only 86.9kg in those days. The average income was only 160 *yuan* per person. It was an area with extensive cultivation, but where there was insufficient food and clothing.

Based on these findings it was decided that the objective of development in the region should be "to build a complex, artificial sparse forest community composed mainly of economic forests and plants that are drought resistance, thus integrating economic, ecological, and social benefits". The economic benefits should be particularly emphasised because poverty was a major problem.

Water and Soil Multi-cascade Accumulation Engineering

Drought and barren soil are the major environmental features in the hilly areas of the Taihang Mountains. The excessive flow of water and soil is the cause of barren hills. Three kinds of engineering methods (fish-scale pit; contour bamboo furrow; and little den) have been adopted to investigate the effectiveness of these methods.

Reducing water evaporation also is an important measure for controlling soil moisture. Four kinds of water conservation methods, such as plastic film mulching, grass mulching, flagstone mulching, and sod-mulching, have been tried. All of these methods have contributed to an increase in the seedling survival rate and to preservation of soil moisture. Among these, plastic film mulching was found to be the best way (Table 1).

Table 1: The Influence of Different Methods of Water and Soil Conservation on the Survival Rate (%)

Species	Pomegranate	Mountain apricot	Average
Plastic film mulching	98.0	95.8	96.9
Grass mulching	84.7	86.0	85.6
Flagstone mulching	86.2	85.3	85.8
Sod mulching	78.8	78.2	76.0
Control	62.6	72.4	67.5

Selection of Adaptable Biological Species

Selecting adaptable biological species is the key to success. Comparing the morphological and biological characteristics of different populations, taking into account the environmental condition in the experimental region, and giving due consideration to the principle of ecological economic benefits, 300 biological species (including those from abroad), belonging to 56 genera from 40 families have been successfully introduced.

Among these, over 150 species or varieties have been used for engineering materials, 30 species or varieties have been used for propagation, and more than 30 species have been tested for cultivation.

Matching the Engineering of Different Populations

According to the environmental assessment made, the adaptable plant cover in the experimental region should be grasslands or sparse forests and shrubs. Based on the biological undergrowth principle, 24 types of complex, artificial plant communities from different land types, from ravines and terraces to the tops of mountains, have been established.

Ravines and Terraces. Twelve types of complex artificial communities have been established in ravines and on terraces, including legume crop and grapevines with strawberries, rabbits bred for meat along with grapevines, grapevines with vegetables, grapevines with medicinal plants, apple trees with legume crops, apple trees with strawberries, peach trees with legume crops, peach trees with legume herbages, dogberries (medicinal plant) with legume crops, walnut trees with herbages, walnut trees with dwarf crops.

Hillsides. Nine types of complex artificial communities have been established on mountain slope land, including pomegranate trees with herbages, pomegranate trees with water buffalo gourds, pomegranate trees with dwarf crops, wild cherry trees with herbages, dogberries with herbages, mountain apricots with herbages, mountain peaches with herbages, torchwood planting with herbages, black locust planting with pistachio trees.

Mountain Tops. Three types of complex artificial communities have been established on the mountain tops, including shrubs with grass herbages, Chinese pines with herbages, and legume herbages with grass herbages.

Time Rhythm Engineering

Coordination between natural resources' rhythms and biological species' functional rhythms is a crucial factor in changing natural resources into biomass effectively. It is also an important measure in imitating the harmony and balance of the natural ecosystem. In recent years, two types of demonstration experiment have been tried.

Coordination between Afforestation and Precipitation. Precipitation during the period from July to September accounts for 60 to 70 per cent of the total annual rainfall. The traditional time for afforestation is in the drought period when survival rates are very low. Now seedlings are container-raised for afforestation in the rainy season. The survival rate has increased from 30 per cent in the past to more than 90 per cent at present.

Time Coordination of Complex Communities. Another structure for intensive resource use that has been tried is the use of the biological functional rhythm to build complex communities such as fruit trees with strawberries, rabbits bred for meat under water buffalo gourds, oriental scorpions bred under grapevines, rabbits bred for meat under grapevines, honeybees under walnut trees, etc.

Artificial Food Chain Engineering

This consists of introducing artificial food chain communities into the ecosystem instead of natural food chain communities. Eleven types of artificial food chain have been introduced. Seven types have achieved ideal results, the other four types have been tested successively.

Forest Land with Chickens. Chickens having high energy conversion efficiency can consume grass seeds, leaves, and insects. The grass and insects are feed for the chickens, which in turn eliminate the insect pests and improve the soil quality with their excrement. In two years from 1987 to 1988, 2,540 chickens have been bred with a 90 per cent survival rate. The net profit per chicken was 1.20 *yuan*. The density of the insect population on forest land decreased by 90 per cent. The excrement improved soil fertility and the percentage of plant cover increased by over 10 per cent.

Forest and Grass with Rabbits. Rabbits are an important part of the natural forest food chain. Rabbits kept for meat production consume leaves and grass on the forest floor. This converts the low-value, green plant material into high-value meat, free of toxic residues. The rabbit excrement fertilises the forest soils. Eleven varieties of rabbit from home and abroad have been introduced successively since 1987.

Flour Beetle, Oriental Scorpion, and Rabbits with Grapevines. Using wheat bran to raise flour beetles, flour beetles to raise oriental scorpions, and residues of the flour beetle to raise rabbits, 30,000 oriental scorpions have been bred. The grapevine trellis shuts out

sunlight which promotes the development of the scorpions and makes full use of the space to produce grapes.

Forest Fruits with Honeybees. In order to make full use of plant resources for honeybees, Italian honeybees have been introduced. Because of the pollination effect, fruit output increases by 20 to 50 per cent.

Attracting Useful Birds. To eliminate forest insect pests, measures have been taken to attract useful birds. More than 300 artificial nests have been built in the experimental region. It is shown that, as a result, insect pests in the forest have decreased by 76 per cent.

Application of Insect Sex Attractions: Artificial sex attraction methods have been used to control the oriental fruit moth which harms apricot fruits. The mating rate of male and female moths decreased by 52.5 per cent. The wormy fruit rate (WFR) of apricots has decreased by 50 per cent.

Other methods of pest control, such as bacterial powder and ultraviolet lamps, are also being experimented with.

4. Tentative Effects

Based on the past seven years of research in ecological engineering, remarkable results have been achieved. The percentage of plant cover in the experimental region has increased from less than seven per cent in 1986 to 30 per cent at present. Water and soil erosion has been basically controlled. Soil erosion decreased from 1,450T/km^2/year before 1986 to 33.6T/km^2/year at present. The fruit yield per plant increased from 2.5kg in 1986 to 10.3kg at present. The annual income for farmers living in the experimental region has increased from 160 *yuan* to 228 *yuan* per capita. The total economic benefit created by the project has reached 10,400,000 *yuan*, which is 13 times as much as the national investment, including 978,000 *yuan* of direct economic benefits.

5. Conclusions

Comprehensive ecological engineering, which takes into account the physical and socioeconomic environment of the locality, has been found to be an effective approach to the regeneration of ecological conditions.

The destruction of the ecosystem is a change from quantitative degeneration to qualitative degeneration. The major reason for the failure of afforestation in the mountains is because of the attempts to build biological communities that require a high quality environment in poor environmental conditions.

There is a cardinal difference between traditional afforestation and forestry ecological engineering. The former attempts to build an artificial plant community, while the latter's objective is to build an artificial ecosystem.

The forest ecological engineering approach first advanced and carried out in the Taihang Mountains has yielded some promising results. Further research work, however, will be more difficult. The ecological experimental station in the hilly area of the Taihang Mountains is now being expanded with the support of the Chinese Academy of Sciences. It is now regarded as a national priority project.

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SCIENCE AND TECHNOLOGY AND POVERTY ALLEVIATION: THE CASE OF THE JUN CHENG VILLAGES, TANG COUNTY, HEBEI PROVINCE

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1. Introduction

The experimental area for agriculture in drought-stricken districts of the hilly zone in the Taihang Mountains is located in the Jun Cheng villages, Tang County, Hebei Province. It is hilly land on the northeast side of the Taihang Mountains covering an area of eighty-five thousand *mu*. There are fifteen administrative villages with a population of 10,962 persons in 2,800 families.

The Jun Cheng villages have traditionally and historically remained poor. In spite of many efforts and some improvement, a peasant's life in the Jun Cheng villages remains poor even today.

2. The Process and Practice of Technology Promotion

In 1981, the National Committee for Sciences and Techniques included a study in resource exploitation in the Taihang Mountains in its Sixth Five-year Plan. The provincial committee of sciences and techniques set four programmes, the high productivity of jujube, persimmons, rice, and rabbit farming, as priority projects and established research bases in the Jun Cheng villages. The programmes were jointly carried out by the University of Agriculture in Hebei Province and the Agricultural Department of Tang County. The programme experts introduced a technique for high productivity in rice and applied it in the experimental area in 1982. Since then peasants in the Jun Cheng villages have had enough food to eat. The plantation of jujube (Chinese date) and persimmon trees and sheep and rabbit management also developed.

In 1986, the second phase of the Jun Cheng project began under the Seventh Five-year Plan. Under the Jun Cheng project, agricultural development and scientific and technical progress have been achieved by means of adjustments in the crop structure and the introduction of new species and plantation techniques. By 1990, gross grain production in the Jun Cheng villages increased to 4.188 million kilogrammes from the average figure of 1.665 million kilogrammes in the years from 1983-1985. In the same period, the grain production per *mu* increased to 387.5kg from 161kg, the per capita grain availability increased to 337.5kg from 165kg. The average personal income in 1991 was 629 *yuan* and in the experimental centre, Xing Yingou village, the average income was 850 *yuan* in 1991.

The project involved the following elements.

The Study, Model Building, and Popularisation of Advanced Techniques according to Resource Advantages

Remote-sensing and a field survey were carried out to map the present land-use situation. The climate, water, and biological resources were carefully investigated. The results showed that out of the total 85 thousand *mu* of land, eight thousand *mu* was irrigated land, which meant it had a great potential for grain and vegetable production; 9,000 *mu* had jujube trees and mixed plantations, which meant it had a potential for fruit production; 7,000 *mu* was grass land, which could be used for grazing; 47 thousand *mu* was sloping land, which could be built into terraced fields for fruit farms; and 6,000 *mu* was dry terraced land, which could be cultivated and fertilised to raise its productivity. The villages had 5,500 active workers.

Based on the above analyses, five measures were proposed.

(a) Introduction of improved varieties of wheat, corn, rice, and vegetables and popularisation of plantation techniques for increased production.

(b) Adjustment of the planting proportions of various crops on dry land. The plantation of cereal crops and legume crops should be reduced, whereas the plantation of peanuts, sweet potatoes, and cotton crops ought to be increased. It was also necessary to introduce improved varieties of crops, increase the amount of fertiliser, and popularise planting techniques under dry conditions.

(c) Building of fruit farms on dry sloping land. The emphasis was on the management of jujube and persimmons.

(d) Efficient use of grassland and management of animal husbandry and poultry.

(e) Development of industries, business, and services and organisation and training of the labour force for labour export.

Efficient Use of Dry Land and Popularisation of Planting Techniques under Dry Conditions

Annual precipitation is only 690mm and is not distributed evenly throughout the year. Precipitation in spring accounted for 10.2 per cent of the total yearly precipitation. Uncertainty of precipitation influenced crop productivity. Drought imposed limitations on crop production.

The second limiting factor is poor soil conditions. The soil layer is thin and the amount of organic material very low. Soil erosion is serious and limits the use of water for crops. The texture of soil in the Jun Cheng villages is sandy, sand mixed with loam, and gravel sand mixed with soil. The thinnest soil layer is 30cm, and the thickest soil layer is 1.2m.

Retention of fertilisers and water is poor. The percentage of organic materials in the soil is 0.6-6.1 per cent, the percentage of gross nitrogen 0.05-0.06 per cent, the proportion of effective nitrogen lower than five ppm, and the effective potassium about 100 ppm. There are also parts of the dry sloping land which contain lower than 0.6 per cent of organic material and have less than eight ppm of grass nitrogen. Deficiency in soil nutrients seriously limits the efficient absorption of water by crops.

The third limiting factor is extensive management. Because of the dry climate, poor soil conditions, and difficult transportation, management is extensive. The area of plantation is large, but production is low.

The resource advantages in the Jun Cheng villages are also obvious and have not been exploited. The potential for increases in production is great. The main resource advantages are given below.

(a) There is abundant solar energy. Annual radiation is 127.7 calories/cm^2.

(b) Thermal resources are abundant. The annual average temperature is 17.2°C. There are 279 days in which the temperature is higher than 0°C and 195 days without frost. Such thermal conditions are suitable for the growth of various plants and two harvests can be obtained in a year.

(c) Labour resources are abundant and intensive management can be accomplished. With 5,500 active workers there is enough labour to improve the soil conditions and manage the land intensively.

Given these characteristics, production on dry lands could be improved considerably. First, it is necessary to adjust plantation structures and improve crop varieties according to the natural conditions on dry lands and the biological characteristics of crops. Secondly, it is necessary to popularise these techniques.

There was a tradition of planting jujube trees on dry slope lands. Jujube trees can adapt to dry conditions and use nutrients efficiently. Production of jujube trees in the area is high and steady. Problems were caused by pests and epidemic diseases which decreased production. The popularisation of new plantation techniques changed the situation. A mature jujube tree can produce 200kg of jujube fruits which are worth 400-500 *yuan*. The profits are three or four times those from cereal or legume crops which can produce only 50-100kg/*mu*, worth 50-100 *yuan*.

The traditional crops on dry lands are cereal or legume crops. Peanuts, sweet potatoes, cotton, and tobacco were planted in the experimental area. Plantation techniques for increased production of these crops were explored and popularised, because these crops can adapt to dry conditions and use thermal, solar, and water resources efficiently. Sweet potatoes can produce 2,500kg/*mu*, which can be processed into 800kg of dry potatoes. Peanuts can produce 150kg/*mu*, cotton 60kg/*mu*, and tobacco 125kg/*mu*. The profit from one *mu* of land is up to 400-500 *yuan*. These crops can grow quickly even in poor dry conditions.

Establishment of Service Stations for Technology Dissemination and Material Exchanges

Small-scale management of agriculture seriously impeded the popularisation of new techniques and intensive management of plantations. According to investigations in the Jun Cheng villages, an average family had two active workers and contracted four to five *mu* of cultivated land on which there were 50-100 jujube trees, a piece of vegetable garden, one pig, two sheep, and ten chickens. In order to promote advanced techniques, sixteen service stations, managed by 56 experts and professionals, familiar with new techniques and comprehensive management, were established. The stations directly serve the peasants. Their services are in (a) technical consultation, professional training, information dissemination, pest and epidemic disease forecasting, etc; (b) production material supplies such as the seeds and seedlings of improved varieties, fertilisers, pesticides, forages, machines and irrigation systems, and agricultural product processing and selling; and (c) the service of comprehensive management. The service stations promote integrated planning and organise projects which a single family cannot accomplish such as construction of irrigation systems, road construction, environmental conservation and fund collection; and monitoring services. The service stations undertake to monitor the achievements in areas such as forest protection, fruit garden protection, vegetable garden protection, and harvest protection.

Because of the establishment of service stations, a new system for extension of advanced techniques has been established. The significance of the establishment of service stations is that (a) they are helpful in attracting experts and professionals from outside to work in the mountainous districts - the experts have an institute to depend on and assistants to cooperate with; (b) they help popularise advanced techniques which will take root among the villages, families, and peasants themselves; (c) they are helpful in raising the educational levels of the peasants; (d) they provide training services to officers, strengthen the relationship between government officers and the masses, and increase the confidence of peasants and the communities; and (e) they strengthen the leading role of the government and promote the community economy.

THE ROLE OF TECHNICAL ASSISTANCE IN ACCELERATING DEVELOPMENT IN A POOR MOUNTAIN AREA: THE CASE OF WEST LIAONING IN CHINA

Wen Dazhong

1. Introduction

Nuluerhu mountain region is one of the 18 poor regions in China. Since 1983, scientists and technicians from the Agro-ecology Department of the Institute of Applied Ecology, Chinese Academy of Sciences and other units have been engaged in technical assistance for accelerating development in a county of the Nuluerhu mountain region, Kazhuo county in western Liaoning. This technical assistance was supported by several projects from different sources, including national and local government agencies and the Chinese Academy of Sciences. These projects were implemented successfully. This paper summarises the basic experiences.

2. Profile of Kazhuo County

Kazhuo county is located in the western part of Liaoning Province in northeastern China. The total area of the county is 2,240sq.km. The county is mainly hilly and mountainous. Only one-third of the total area has level terrain. The annual average temperature is 8.3°C and the annual frost-free period is 140 days. The annual precipitation is 450-500mm. The severe variations and fluctuations in precipitation result in frequent droughts, especially in spring. Figures for recent decades show that severe drought years, drought years, and no drought years, account for 57 per cent, 17 per cent, and 26 per cent respectively. Soils are of poor quality and are highly susceptible to erosion. The natural vegetation in the county has been deteriorating since the 18th century because of the impact of rapid population growth.

In the early 1980s, the county had 360,000 inhabitants with 70,200 families living in 236 villages. The population density was 160 persons/km^2. This dense population had a serious impact on the fragile ecosystem. About 53 per cent of the total area was suffering from serious soil erosion. At least five million tonnes of soil were being washed away from the area annually, equivalent to a soil loss of 24T/ha/yr. About 1.23 million tonnes of soil were eroded from crop fields annually, which is equivalent to a loss of 15.5kg/ha of nitrogen (Yan 1988). The frequent droughts and serious soil erosion have become the major obstacles to agricultural development in the county. Crop yields were low and unstable. Poverty and food shortages were common. From 1981-1983, the average grain crop yield in the county was only one-third of the national average, and the annual consumable grain availability per capita was 160 kg. Food consumption in calories was only two-thirds of the national average level (Wen 1989). In addition, households suffered from fuel shortages. The average fuel consumption of peasant families only met half of their needs (Wen 1989). Residents had to reduce cooking to about once a day in summer and live in cooler rooms in winter.

The shortage of food and household fuel supplies in turn forced people to extract more natural resources. Most people in the countryside suffered from acute poverty until the early 1980s. The average annual net income of the people was only about 110 *yuan*. Education and technology were also very backward.

3. The Basic Objectives and Strategies of Technical Assistance to the Poor Area

The Basic Objectives

In Kazhuo county technical assistance focussed on the following basic objectives:

(a) to help local people to fully develop local resource potentials to produce more food and fuel;

(b) to help local people to generate the capability for developing a local commodity economy; and

(c) to help local people to improve local ecological conditions for sustainable development.

The first objective was given priority during the early stages of technical assistance. However, the three objectives are very closely related. Obviously, it was hard to develop a local commodity economy and improve local ecological conditions when people had not enough food to eat. Conversely, if the local commodity economy was undeveloped and the ecological conditions were getting worse, poverty alleviation was not possible.

Working Strategy

In commencing technical assistance in Kazhuo county, the following working strategy was determined.

(a) The rural area of Kazhuo county was considered a complete system, an ecological-economic complex. Based on systems' analysis, a regional development strategy was formulated.

(b) Attention was devoted not only to introducing appropriate and applicable techniques, but also to introducing innovative new techniques to fit local conditions; and

(c) a typical village was selected as an experimental and demonstration base - technical assistance was extended through the base village to the whole region.

4. Study of the Regional Development Strategy

The whole rural area of Kazhuo county, as an ecological-economic system, consisted of a crop system, tree plantation system, grassland system, orchard system, domestic animal system, and a population system. Based on the situation obtaining in the early 1980s, the

material and energy relations between these subsystems were analysed. The following regional development strategies were drawn out according to the analysis.

1. General Strategy of Rural Development. Effectively controlling the population; actively developing local natural resources; improving agricultural techniques and management; producing enough food for local residents; actively developing cash crops, orchards, and animal husbandry in order to improve residents income; and promoting afforestation for increasing household firewood supplies and conserving water and soil from erosion.

2. Specific Strategy for Improving Local Food Supplies. Developing irrigated crop and terraced fields; setting up intensively-managed basic food crop fields in order to have bigger and more stable harvests; and gradually reducing the number of pigs in order to reduce grain consumption by animals.

3. Specific Strategy for Improving Residents' Income. Increasing cash crops, such as cotton and tobacco, which are profitable in the area and developing intensively-managed orchards on better sites for commercial fruit production.

4. Specific Strategy for Improving Household Fuel and Soil Conservation. Promoting shrub and firewood forests on eroded slope areas; replacing the less productive timber plantations in some sloping areas with shrub plantations in order to produce more fuelwood and to have better conservation functions; and providing more efficient cooking stoves in place of traditional stoves to save household fuel.

5. Working Base for Technical Development, Demonstration, and Extension

A typical village, Xiahetao village in the southern part of the county, was selected as the working base for technical assistance in 1983. More than ten scientists and technicians have worked there since 1983. Many technical studies and development, demonstration, and extension works were carried out in the village.

Technical Studies and Development

Scientists and technicians have studied, introduced, and developed the following in the village according to local requirements.

(a) introduction of new crop varieties; (b) development of efficient farming systems, e.g., the relay inter-cropping of spring wheat with corn, or spring wheat with tobacco instead of corn mono-cultivation; (c) introduction of techniques for a more efficient use of water resources in agricultural production, e.g., irrigating in winter to prevent spring drought and water-saving irrigation methods; (d) introduction of rational fertilisation techniques, e.g., increasing phosphorous fertiliser in P-deficient soils and rational use of NPK; (e) promotion of firewood forests on eroded mountain slopes; (f) disseminating techniques for the intensive management of apple orchards; and (g) improving household animal husbandry management.

These techniques have been successfully developed, satisfactorily demonstrated, and effectively promoted.

Demonstration Works

The whole village of Xiahetao was considered to be the demonstration focal point. The purpose of the demonstration was to show the actual benefits derived from implementing local development strategies. The idea was to encourage other villages around this area to follow these methods. The village people cooperated in carrying out the demonstration programme. The local government of Kazhuo county actively supported the village demonstration programme. The following projects have been implemented by the village demonstration programme: (a) working out an integrated development plan for the village; (b) setting up one *mu* (0.07ha) per capita of basic crop field, which can be irrigated, intensively managed, and have higher and more stable yields; (c) constructing terraced fields; (d) using new crop varieties; (e) adopting more efficient farming systems; (f) using more effective water management techniques; (g) effectively managing agricultural wastes as animal feeds and organic fertiliser; (h) developing intensively-managed apple orchards in fertilised terraced fields; (i) establishing a firewood forest on eroded mountain slopes; and (j) distributing more efficient cooking stoves.

Food production and household income have significantly improved through these demonstrations. Compared to the period from 1981-85, from 1986-90, the average per hectare grain yield increased by 52 per cent, the average annual per capita of consumable grain increased by 59 per cent, and the average annual per capita net income increased from 180 *yuan* to 502 *yuan*. The annual per capita net income of the village in 1990 reached 580 *yuan*, which is more than the national average.

Extension Works

The successful experiences of technical development and demonstration in the village have been extended to other villages in the region. The local government has encouraged other villages to follow these experiences. Training courses and field visits have also been organised. Scientists and technicians also visit other villages in the region to spread techniques and methods.

In fact, since 1986, Kazhuo county has not been considered a poor county. Kazhuo county was the first to get rid of poverty among the counties in the Nuluerhu mountain region. Technical assistance has contributed to this development.

6. Conclusions

It is nearly 10 years since the commencement of technical assistance in Kazhuo county. Summing up the experiences the following conclusions emerge.

1. It is important to give financial and material support to the poor mountain regions in order to improve their economy. However, it is more important to give these regions effective technical assistance in order to increase their self-development capacities.

2. The basic objectives of technical assistance in these poor regions is to help local people to develop fully the local resource potentials to produce enough food, to develop a local commodity economy, and to improve local ecological and environmental conditions.

3. The technical assistance should be comprehensive and multi-hierarchical.

4. It would be more profitable to organise an integrated team consisting of relevant scientists and technicians to work for technical assistance.

5. The technical assistance may include strategical studies for regional development, some applicable technical development research, and some typical demonstration and extension work.

6. Typical villages should be selected as the base for technical development, demonstrations, and extension work.

7. It is necessary to give technical assistance and financial support through multiple channels and on a long-term basis.

8. The technical assistance teams should cooperate with the local government and the people.

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A STUDY ON THE MANAGEMENT AND DEVELOPMENT OF MOUNTAIN REGIONS: THE CASE OF THE TAIHANG MOUNTAINS IN HEBEI PROVINCE

Wang Zheng-Guo
Guo Wei-Dong

1. Introduction

The mountainous region development programme in Hebei Province started in 1979. It became one of the major projects of the State Scientific and Technical Commission in 1981 and was included in the "State Spark Plan" in 1986. In the past decade, 216 Spark projects have been executed. The "Taihang Mountain Development Research" was recognised as a Scientific and Technical Achievement and was awarded the State Spark Prize. The Taihang Mountain Development Programme emphasised the application of science and technology, and a number of achievements were recorded. In 1991, compared to 1978, the total gross output value of industry and agriculture in the mountainous regions rose from 5.67 billion to 31.5 billion *yuan*; the total grain output rose from 6.312 million to 7.5 million tonnes; the total fruit output increased from 0.18 billion kg to 0.78 billion kg; and the annual per capita income of the peasants rose from 89.4 *yuan* to 560 *yuan*. As a result, the poverty of three million peasants was alleviated. The traditional agricultural structure also underwent changes. The contribution of industrial output increased from 44 to 70.8 per cent between 1980 and 1990.

2. Approach to Mountain Region Development

The economic, ecological, and natural resource conditions in the mountain region of Hebei Province differ considerably. A mountain region development strategy and mountain management principles were formulated after initial investigations and research into the characteristics of poverty. The development strategy was based on coordinated and comprehensive management of major mountain resources -- rivers, forests, agriculture, and infrastructure. Agriculture, horticulture, animal husbandry, and agro-processing were looked upon as parts of an integrated development package. A combination of short-term as well as long-term objectives and targets was identified.

The idea was to achieve economic, ecological, and social development simultaneously. Comprehensive exploitation of natural resources, poverty alleviation, and prevention of natural disasters were taken as the three principles of mountain management. Projects with resource advantages, potentials for increase in production, and obvious economic benefits were chosen first and implemented to have the largest demonstration effect. Applied research, technical development, and extension were seen as elements which organically link scientific research with production. Scientific research was aimed at social and economic construction. The task of administration was to organise, coordinate, and ensure the smooth implementation of development programmes. Every district, city,

and county was given overall responsibility for experimental sites in their locations. Special teams, consisting of scientists and technicians at district (municipal) level, peasant technicians, and science and technical demonstration households, were formed. These teams were responsible for the dissemination of techniques in every village in the mountainous region. Personnel directly participating in the task in the experimental areas numbered a thousand and came from more than 40 colleges and research institutions. These included specialists in animal husbandry, veterinary sciences, horticulture, vegetable production, agricultural and livestock product processing, agronomy, plant protection, soils, fertilisers, water conservancy, and agricultural economics. Under their guidance, more than 9,000 peasant technicians and more than 3,000 scientific and technical demonstration households took part in the technical development task. A technical network of leaders, scientists and technicians, and peasants was formed. This system kept the leadership united, contributed to the efficient use of the labour force, and strengthened the relationship among departments.

The rabbit project provides an example of the working of the system. In 1982, 4,800 improved breeds of rabbit had been delivered to 18 counties and distributed to 3,700 households in 19 villages in the Taihang mountain area. In every county, one rabbit breeding farm was established and was made responsible for the distribution of rabbits in every county. By the spring of 1986, more than 600,000 rabbits had been propagated and distributed to 72 villages in 24 counties, resulting in an output value of more than 5,200,000 *yuan*.

3. Organising Demonstration Areas

To popularise the scientific and technical results achieved at experimental sites and further verify their adaptability, 10 model districts in a total area of 61,300 ha were organised. These included demonstrations in jujubes (Chinese dates), walnuts, Chinese hawthorn, Chinese chestnuts, apricots, etc. In the jujube high yield model technology area of Zanhuang, the coverage was expanded from three villages to 15 villages. With the spread of the conventional technology of grafting and pruning, the yield of a single jujube tree increased from 1.8kg to 8.1kg. The total output of the model area increased from 750,000kg to 5,000,000kg, earning an additional income of 3,000,000 *yuan*.

4. Propagation of Complex Technology

Projects that required high investments and complex technologies were introduced in selected experimental spots to promote economic growth in surrounding areas. In Maoshan Fruit Processing Factory, Xinglong county, a low sugar content, preserved fruits processing line; a hawthorn stone oil evaporating technology; and hawthorn original juice production technology were successively imported. The output value from plants rapidly increased to 8,000,000 *yuan* per year. The processing technology and a complete set of installations were popularised all over the county. Hebei Agricultural University, with its 12 affiliated extensions, helped in the programme. The training was carried out locally. For example, in Zhuolu county, Zhangjiakou district, 500 junior level forestry technicians have been trained since establishment of the extension.

5. Institutionalising Science and Technology at Local Level

Individual, peasant scientific research institutions have been set up with resources invested by their own members and are solely responsible for the communities' profits and losses, etc. At present there are more than 40 institutions of this kind, with 283 professional scientists and technicians and almost 1,000 guest researchers.

6. Efficient Use of Funds

In the past 10 years, the following reforms have been carried out to ensure more efficient use of funds.

(a) Since 1983, a system of partial to complete repayment has been introduced in the administration of a technical development fund. Different repayment installments have been defined, based on the project content, working intensity, and economic benefit. A system of rewards for better performance has also been introduced.

(b) The contract responsibility system has been introduced for technology dissemination projects.

(c) An input supply system has also been introduced.

Section D

Approaches to Poverty Alleviation: Agricultural, Industrial, and Institutional Development

SOME ECONOMIC PROBLEMS OF AGRICULTURAL RESOURCES DEVELOPMENT IN CHINA'S POOR MOUNTAIN AREAS

Zheng Dahao

1. Estimating the Potentials for Developing Mountain Resources

Considering the importance of grain production in mountain areas, the potentials for grain production need to be determined in advance. We can classify farmland according to altitude above sea level, slope, and soil texture as relatively fixed factors. We can also classify farmland according to variable factors such as chemical fertilisers, farmyard manures, pesticides, use of plastic sheets, use of improved varieties, multiple crop indexes, and so on. Using cross-sectional and time series data we can then estimate the production functions. The results of production function estimates should be confirmed by local level officials and agronomists.

We can also estimate the acreage, output, and output rate of other products such as oil crops, tea, silkworm cocoons, citrus, edible mushrooms, herbal medicines, and some mineral products which are mined by peasant farmers. Table 1 shows the increment per *yuan* of input in selected products in Zi-Yang county which is located in a poor mountain area of southern Shaanxi Province.

Table 1: Increment per *yuan* of Input in Selected Products, Zi-Yang County, 1988

Product	RMB *yuan*	Product	RMB *yuan*
Grain	1.21-1.60	Edible mushrooms	5.00-7.00
Oil crop	1.20-1.25	Silkworm cocoons	6.49-6.20
Tea	3.10-5.30	Coal	1.09-1.91
Citrus	5.16-6.20	Manganese ore	1.13-1.23

Table 1 reveals that, *ceteris paribus*, peasants will not give priority to grain or oil crops, or coal, or manganese, or mining because increment in production per *yuan* of input is high in forest-related products such as silkworm cocoons, edible mushrooms, citrus fruits, and tea. One point should be noted however. Because of the importance of grain in poor mountain areas, peasants can move on to more profitable products only after self-sufficiency in or adequate availability of foodgrains.

2. Meeting Foodgrain Needs

In most mountain areas, the market price of grain (P) is negatively related to the level of grain self-sufficiency (X) or

$$P = a-bX$$

where,

a and b are constants.

Peasants will shift the resources from grain production to forestry and special products only when the output value of grain per *mu* equals, or is lower than, the output value of forestry and its special products per *mu*, that is -

$$P.Y \leq V$$

where,

P = price of grain
Y = grain yield per *mu*
V = output value of forestry and its special product per *mu*

or,

$$(a-bX)\ Y \leq V$$

This is the reason why the peasants in poor mountain areas place grain self-sufficiency as the first priority in agricultural development.

For most poor mountain areas in China, self-sufficiency appears to be the best way to solve the grain problem, because of the following reasons.

- Grain imports mean higher grain prices which mountain peasants cannot afford to buy.

- Transport costs are higher. Also road maintainance costs are also significant in the mountains. Further, fertiliser purchases are more worthwhile than grain purchases in the mountains.

- According to investigation and grain production functions, total yield increment from increased yield per *mu* from farmland with slopes of less than 2° can make up for the loss of yield from farmland with slopes of more than 25°.

- There are difficulties and risks involved in purchasing and transporting large quantities of grain from outside.

- The amount of cultivable land in the mountains remains low. So, once a mountain area achieves grain self-sufficiency, most of the agricultural resources, including labour, will be shifted to forestry, and horticulture, which are usually much more profitable than grain production.

3. Criteria for Coordination between Forestry and Agriculture

It is urgent to revert farmlands with slopes of more than 25° to plantations. However, for this to happen, peasants need to be assured of relatively quick returns.

Forestry is a long-run production system compared to agriculture. The first criterion for organising these two kinds of production is to let the net present value of long-run production gains equal the net present value of short-run gains.

$$NPV_1 = NPV_s$$

since,

$$NPV_i = \sum_{i=1}^{n} \frac{G_{li} + GI_{li}}{(1+r)^i}$$

where,

G_{li} = long-run gains in the ith year
GI_{li} = long-run gains from inter-cropping in the ith year
r = interest rate

and,

$$NPV_s = \sum_{i=1}^{n} \frac{\bar{G}_s}{(1+r)^i}$$

where,

$\bar{G}_s$ = average short-run gains

when the first criterion is met

$$\sum_{i=1}^{G_n} \frac{G_{li} + GI_{li}}{(1+r)^i} = \sum_{i=1}^{n} \frac{\bar{G}_s}{(1+r)^i}$$

$$\bar{G}_s = \sum_{i=1}^{n} \frac{G_{li} + GI_{li}}{(1+r)^i} \Bigg/ \sum_{i=1}^{n} \frac{1}{(1+r)^i}$$

Thus, if this value of G_s is larger than the value on the right side, it is advantageous to use the land for short-run production; conversely, the long-run production system would be better.

The second criterion is to let the long-run net present value ratio of gains to input equal short-run net present value ratio of gains to input.

$$\sum_{i=1}^{n} \frac{G_{li}+GI_{li}}{(1+r)^i} \Bigg/ \sum_{i=1}^{n} \frac{I_{li}+II_{li}}{(1+r)^i} = \sum_{i=1}^{n} \frac{\bar{G}_s}{(1+r)^i} \Bigg/ \sum_{i=1}^{n} \frac{\bar{I}_s}{(1+r)^i}$$

where,

I_{li} = long run input in the ith year
II^{li} = inter-cropping input in the long run in the ith year
I_s = short-run average input

$$\bar{I}_s = \left[\sum_{i=1}^{n} \frac{I_{li}+II_{li}}{(1+r)^i} \Bigg/ \sum_{i=1}^{n} \frac{G_{li}+GI_{li}}{(1+r)^i} \right] \sum_{i=1}^{n} \frac{\bar{G}_s}{(1+r)^i} \sum_{i=1}^{n} (1+r)^i$$

when,

the value of I_s is larger than the value of the right side, it means that the long run production system will be the more profitable, conversely, the short-run production system will be better.

The third criterion is to let long-run marginal net present value equal short-run marginal net present value.

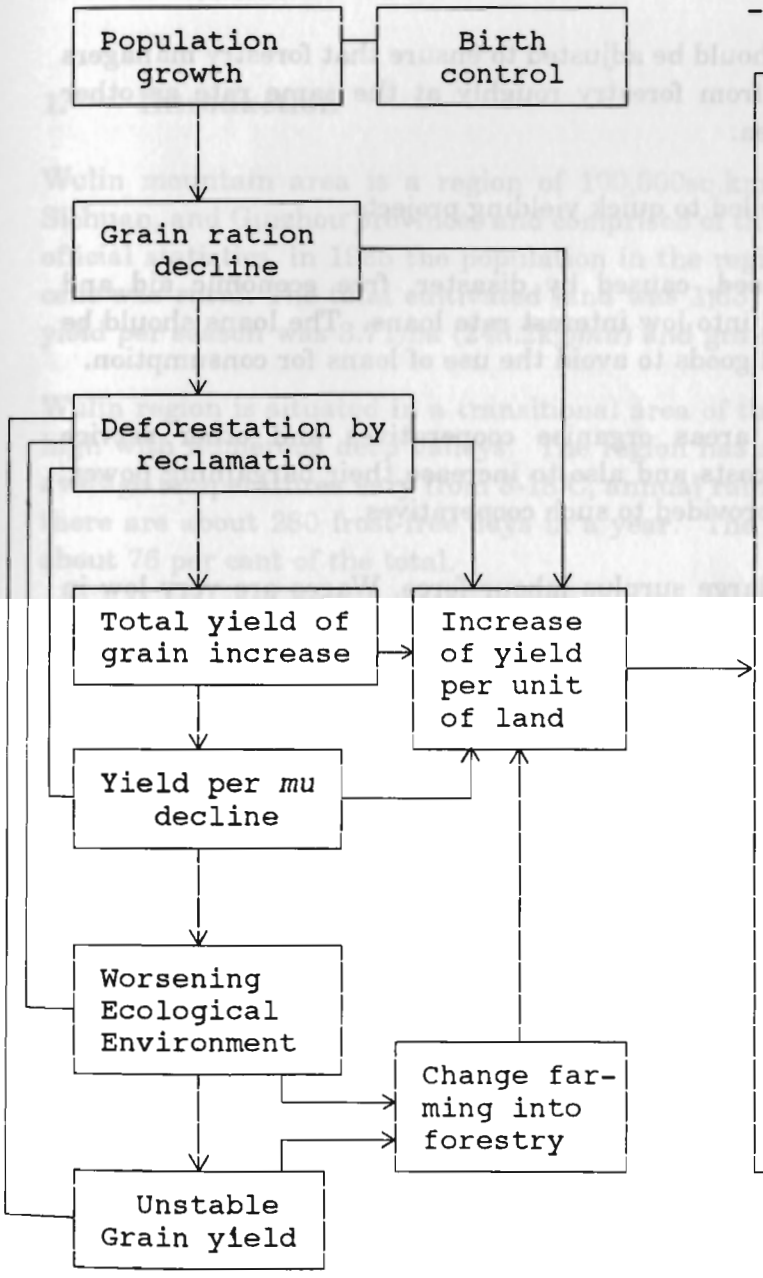
$$\frac{\Delta NPV_1}{\Delta I_i} = \frac{\Delta NPV_s}{\Delta I_s}$$

4. Determination of the Key Strategy

An example of the determination of key strategy and associated key measures is presented in Figure 1.

Systems' dynamics helps in understanding the causalities between targets, products, and other relevant factors. Development programmes can be chosen accordingly and variables adjusted by policy objectives.

Figure 1: Determination of the Key Strategy and Key Measures for Grain Production in Zi-Yang County, 1988



Measures or Inputs	Marginal Return per *yuan* in the Beginning
Nitrogen chemical fertiliser	5.68
Phosphate chemical fertiliser	4.01
Potassium chemical fertiliser	1.83
Farmyard manure	3.80
Plastic sheets	0.88
Improved varieties	3.26
Multiple planting	2.20
Rational close planting	2.18
Plant protection	
Green manure	2.90
Irrigation	1.50
Levelling of farmland	1.40
Improvement of paddy fields	1.80
Farm animals	

5. Policy Suggestions for Agricultural Development in Poor Mountain Areas

- Marginal returns from inputs, apart from labour, are much higher in poor mountain areas, so an increase in the supply of agricultural inputs,such as chemical fertilisers, pesticides, plastic sheets, diesel oil, and electricity,can contribute significantly to increases in the total agricultural output in a mountain economy.

- Reclamation of land in areas with slopes of more than 25° should be prohibited by legislation. Such lands should be reverted to forestry or pastures.

- The prices of forest products should be adjusted to ensure that forestry managers and peasants receive profits from forestry roughly at the same rate as other industries in the mountain area.

- Investments should be channelled to quick yielding projects.

- Except in cases of urgent need, caused by disaster, free economic aid and investment should be changed into low interest rate loans. The loans should be offered in the form of material goods to avoid the use of loans for consumption.

- Help peasants in mountain areas organise cooperatives and other service organisations at low average costs and also to increase their bargaining power. Low interest loans should be provided to such cooperatives.

- Poor mountain areas have a large surplus labour force. Wages are very low in these areas. There is a good opportunity to organise the labourers to engage in road building, irrigation works, farmland improvement,etc. The wages can be paid at favourable rates in the form of material goods.

- Since the working and living conditions in poor mountain areas are very hard, many technical personal do not like to stay in these areas. Measures need to be taken to attract such personnel.

PROBLEMS AND STRATEGIES FOR INCREASING GRAIN PRODUCTION IN THE POOR RURAL REGION OF THE WULIN MOUNTAIN AREA

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Wu Jingfen

1. Introduction

Wulin mountain area is a region of 100,000sq.km. covering parts of Hunan, Hubei, Sichuan, and Guizhou provinces and comprised of three counties and cities. According to official statistics, in 1985 the population in the region was 16,270,000, of which 90 per cent was rural. The total cultivated land was 1,637,000ha (24,560,000 *mu*). The grain yield per season was 3.7T/ha (248.2kg/*mu*) and grain availability was 310kg per year.

Wulin region is situated in a transitional area of the Guizhou Plateau. Mountains are high with numerous deep valleys. The region has a humid, monsoon climate. Annual average temperatures vary from 8-18°C, annual rainfall is between 1,200-1,600mm, and there are about 280 frost-free days in a year. The rainfall from April to September is about 76 per cent of the total.

Cultivated areas are below 1,400m. The per capita holding is 0.086ha (1.3 *mu*). Under normal circumstances, there should be adequate food. However, in this region there are 40 poor counties. In 1985, the statistics of 33 counties indicated that the poor accounted for 56.9 per cent of the rural population. Grain production was very low, for example, average rice and maize yields were 3.5-4.2T/ha (250-280kg/*mu*) and 2.2-2.6T/ha (150-170kg/*mu*) respectively. About 226,500 tonnes of grain were imported each year.

2. Problems in Production of Spring Crops

Investigations showed that the following three factors were the most important in limiting grain production in the area.

Degrading Cultivated Areas and Natural Disasters

The cultivated land below 500m in elevation is only about 20 per cent of the total cultivated land (mainly rice fields). Over 50 per cent of dry land has slopes over 25°. The lands are very poor because of deforestation and subsequent soil erosion. Natural disasters are common. The main limiting factors for grain production are low temperatures during sowing time (March-April) and high temperatures, drought, or hailstorm during July-August.

Undeveloped Transportation

Mountain landforms cause difficulties for building railways and highways. Only the Zhiliu and Xiangqian railways cross the region on the southeastern edge. The railways have a low transportation capacity. Meanwhile, the quality of highways is bad and there are numerous break points. About 20 per cent of villages are without roads. The Wu River is at the western end of the region, but the freight volume of ships is small. Therefore, all these factors contribute to weak linkages with the outside world and restrict the development of agricultural production and a commercial economy.

Traditional Production Methods

The poor production quality is due to a low level of education and a shortage of specialists on agriculture. Illiterate and semi-illiterate people in the region account for around 28 per cent of the total population. There were five agricultural technicians per ten thousand people. Agricultural extension is quite limited, so is the propagation of modern varieties.

3. Strategies

To deal with these problems, the following strategies to increase grain production in the area were developed with the support of the Agricultural Department and have been implemented since 1988.

Promotion of New Harvesting Methods

In order to use natural resources fully in the region, the Chinese Academy of Agricultural Sciences organised teams of specialists in many scientific subjects and collaborated with 11 county governments to carry out a new "harvesting programme". Significant economic and social benefits have been achieved in the last four years. A number of counties has been relieved from poverty as a result of increases in grain production and yield.

Promotion of New Seedling Techniques

Although Wulin region has a humid, monsoon climate, seasonal distribution is not favourable to the needs of the growth of spring crops. Crops are often damaged due to low temperatures and cloudy and rainy days, resulting in rotted seeds and low survival rates of seedlings. These factors greatly limit the production of rice and maize.

To avoid the effect of low temperatures, as well as drought, the "nutrient pot" method was popularised to enable growth in a short period. This helped avoid low temperatures and (because of the shortened growth period) drought in the flowering stages. For rice, a two - stage seedlings' method was used to avoid rotted seedlings and to increase the survival rate of seedlings. This technique protects the plant in the heading and flowering stages and harvesting can be carried out before the autumn rains.

Use of hybrid rice, raising seedlings in two stages; standardised transplantation; integrated pest management for rice; use of hybrid maize; planting seeds by using two methods (raising seedlings in nutrients pots and direct sowing, both covered with plastic

film); close planting; and the scientific management of maize played key roles in producing high and stable yields of rice and maize in the Wulin mountain region. In 1991, the average rice and maize yields in the programme areas increased by 67 per cent and 32 per cent respectively compared to those of 1986.

Implementation of Joint Contracts

How can applied technology be disseminated and used in large areas under the new contract responsibility system of crop production in the rural areas of China? It seems that the organisation of production and the exploration of new management methods are very important for solving the problem of inadequate food and clothing in the Wulin mountain area. Applied agricultural technology was often demonstrated on an experimental basis in the past, but extension was limited. Also, local authorities faced a shortage of funds. To deal with this issue, a system of joint contracts with research institutions has been introduced. Research institutions and county governments sign joint contracts clarifying their responsibilities, rights, and benefits. The county government organises a leaders' group, consisting of cadres from several related departments, and establishes a technical guidance group. Similar groups are also organised at different levels in the towns and villages and contracts are worked out. The contract system is applied to all related departments, cadres, agricultural technicians, etc (Figure 1). Comprehensive services include technology dissemination (funds, seeds, fertilisers, plastic film, and pesticides) to the peasants at field level. Specialists and working groups from all levels train the extension workers and peasants. In the 11 counties which joined the harvesting programme in 1991, 547,000 people were trained and 250,000 copies of various technical materials were distributed.

These strategies have contributed to an increase in grain production and contributed to the alleviation of poverty in the Wulin mountain area.

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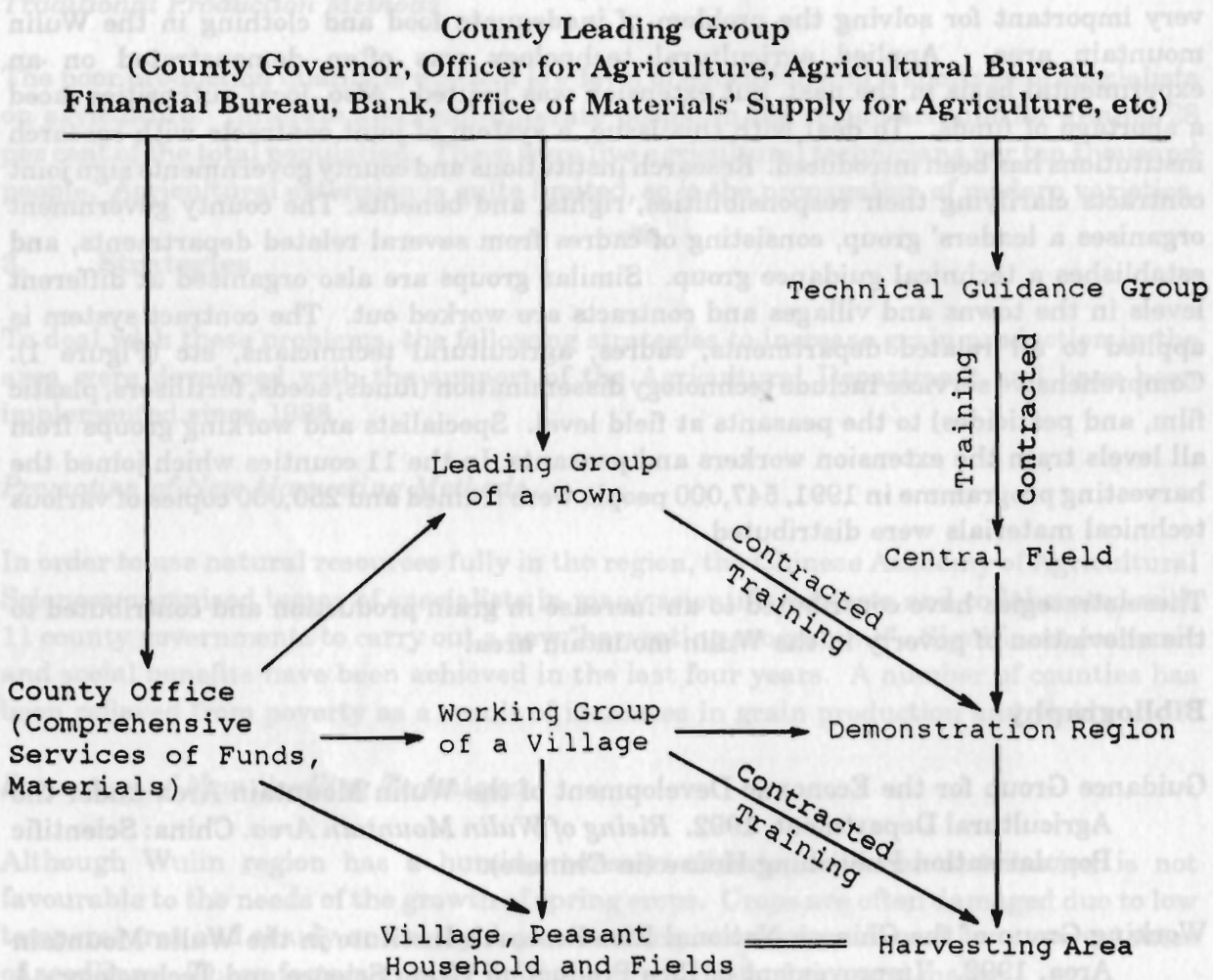
Figure 1: Diagram of the Joint Contract of the Administration Department and Research Institutions



FROM POVERTY TO SUSTAINABLE DEVELOPMENT - A CASE STUDY OF NINGNAN COUNTY, SICHUAN, CHINA[1]

Liu Yanhua
Tang Ya
Wei Taichang
Gu Xianyou

1. Introduction

This paper is devoted to the study and analysis of the transformation of a county in the Sichuan Mountains from poverty to relative prosperity. Ningnan county lies in the Liang Shan Yi Prefecture in Western Sichuan and was selected for this study for the following reasons.

- In recent years, the overall economy of Ningnan has witnessed relatively rapid development with characteristics of sustainability. It has been transformed from a poor area to a relatively developed one.

- The biological, sociocultural, and economic conditions of Ningnan are more or less typical of the Chinese mountains and represent both the constraints and opportunities of mountain specificities, i.e., inaccessibility, fragility, marginality, diversity, 'niche', and human adaptation mechanisms[2].

- A local resource-centred and integrated development strategy has played the key role in transforming the mountain economy from poverty to self-sufficiency and towards commercialisation.

The methodology adopted in the paper was designed to answer the following questions:

- what was the process of the economic transformation of Ningnan County?

- what are the indicators of transformation?

- what factors contributed to the transformation? and

- what lessons can be learned from Ningnan's experience?

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1 This study was camed out as part of the Mountain Farming Systems' (MFS) programme of the International Centre for Integrated Mountain Development (ICIMOD).

2 We are grateful to Dr. N.S. Jodha, Head, MFS division, ICIMOD, who provided the guidance and Dr. Tej Partap who coordinated this study. We are also grateful to the Government and Leaders of Ningnan county who contributed to the work.

The study was undertaken in different stages. The study area was selected on the basis of a review of a number of indicators. Two rounds of field investigations were carried out to gain an in-depth understanding of the transformation process. Intensive discussions were then conducted with farmers, scientists, and local leaders.

2. Background of the County

Physical Environment

Ningnan is a relatively small county, covering an area of about 1,674 square kilometres. Topographically, Ningnan is in a mountainous area. About 8.1 per cent of the territory is comprised of steep mountains/hills, and only 16 per cent is lowland (defined as land with slopes of less than 25 degrees and below 1,300masl). The highest peak in the county has an elevation of 3,919masl. The lowest part has an altitude of 585masl. Heishui, the main river flows from northwest to southeast and runs into the Jinsha River in the upper reaches of the Yangzi. The drainage area of the Heishui River within Ningnan county covers 1,211sq.km., with a water discharge of 68.18 cubic metres/second. The two largest river basins, covering about 10sq.km. each, are located around Ningnan township in the lower reaches of the Heishui River. These are the most populated and better developed areas in Ningnan county.

The climate of Ningnan county can be characterised as subtropical monsoon. The warm season, coinciding with the monsoons, occurs from May to October. The mean annual temperature is 19.3°C, mean annual rainfall is 970mm, and the number of frost-free days in a year is 321. Four altitudinal climatic belts can be identified (Table 1). Diversified climatic conditions provide options in agricultural production.

Table 1: Vertical Climatic Belts, Ningnan

	Altitude Belts (area)	Climatic Condition	Vegetation	Land Use
1	585-1100masl. (160sq.km.)	Arid MAT 18-22 C MAR 700-1000mm	Semi-arid shrubs	Dry valley; 3 harvests/year - rice, sugarcane, tung, subtropical fruits
2	1100-1800masl. (640sq.km.)	Sub-humid MAT 15-18 C MAR 1000-1200mm	Pine, oak	2 harvests/year - rice, wheat, tung, tobacco, orange
3	1800-2500masl. (70sq.km.)	Humid MAT 10-15 C MAR 1200-1700mm	Pine, evergreen trees	1 or 1.5 harvest/year - maize, potatoes, buckwheat, apples, pears, peaches, etc.
4	> 2500masl. (405sq.km.)	Humid MAT < 10C MAR > 1700mm.	Pine, deciduous, trees, sub-alpine shrubs	1 harvest/year - potatoes, buckwheat, oats

Note: MAT: Mean annual temperature; MAR: Mean annual rainfall

Ningnan county is rich in water resources. The mean annual runoff within Ningnan amounts to 630 million cubic metres, equivalent to 52,000 cubic metres per hectare of cultivated land. According to the hydrological survey (1983), the hydropower potential in the county totals 38^{10} kilowatts, out of which, 7.0^{10} kilowatts (equivalent to electricity generation of 2.96^{10} kilowatts hours annually) is economically feasible. By 1989, only 3.73^{10} kilowatts hours or 12.6 per cent of its feasible hydro potential remained exploited. In the long run, hydropower resources could play an important role in development.

The biological resources' survey (1983) showed that indigenous plants in Ningnan county consist of more than 2,000 species, including more than 1,000 medicinal herbs, about 300 species of pastoral grasses, about 50 cultivated vegetables, more than 30 crops, many wild fruits, and other plants having economic value. Many species in Ningnan are more productive or are of better quality than in other areas. These abundant bioresources and their better quality provide opportunities for the further development of Ningnan's economy.

Socioeconomic Background

Ningnan is a remote county and agriculture is the leading activity. In 1989, the population of Ningnan totalled 150 thousand, with a population density of 89 persons/km^2. Of the total population, about 20 per cent are minorities (*Yi, Miao,* Tibetan, *Bai, Man, Tong, Boyi*, etc), and 93 per cent are rurally registered.

Before 1949, feudalism was rife among the *Han* and slavery among minorities. Landlords and slave owners, who were less than five per cent of the population, occupied more than 90 per cent of the land. Agricultural production was considerably primitive, most of the people suffered from hunger. After 1949, the land reform and "people's commune" movement led to some progress in agro-production, but due to poor back-up and irrational management, most of the rural population were still living below the poverty line. Since 1978, with the new policy of rural reform all over China, Ningnan county has undergone great improvements. It is one of the counties in Sichuan which is experiencing rapid development.

At present the economy is self reliant. Raw material production is still the major activity. Commercial production is picking up and shows signs of growing with time.

3. The Process of Transformation: History of Development in Ningnan

The development history of Ningnan since 1949 has basically two stages.

1950 to 1976

From 1950 to 1976, i.e., from liberation to the end of the Cultural Revolution, the development of Ningnan county was characterised by frequent changes of policy. Agriculture, especially crop cultivation, dominated the economy, the development process was slow, and the majority of people were poor.

Frequent Change of Policies and Institutions. From 1950-1952, "land reform" (in the *Han* nationality area), or "democratic reform" (in the minority area), was introduced. The major accomplishment of this reform was the redistribution of land ownership. The broad masses of peasants, 80-90 per cent of the rural population, and farm labour derived real economic benefits from the reform, and consequently the reform resulted in the creation of a system of small family farms.

With the start of the construction of a planned socialist economy in 1953, a new policy phase began that lasted until 1957. This was marred by rapid collectivisation. The production unit changed very rapidly from the "mutual aid team" to the "preliminary collective" and, further, to the "advanced collective". The production unit (mutual aid team) was very simple, even primitive, consisting of several farmers pooling their labour, animals, and implements to undertake agreed agricultural tasks. Under the preliminary collective, the production unit enlarged (normally, 10-15 households), members of the collective retained the titles of their land, and they received an income which reflected not only the amount of labour they contributed but also the amount of land they owned. By 1956, however, most of the preliminary collectives grouped further to make advanced collectives (mostly 1 to 3 collectives in one village) in which the productive activities were managed in a planned manner and where the members' income depended solely on the amount of work contributed, while property titles were maintained in the names of individual farmers.

Compared to individual farm management, the collective system had some advantages.

(i) Public ownership of the land and the means of production enabled collectives to plan the use of land and carry out the necessary farmland capital construction for sustainable use of land. Also collectives could adopt larger-scale production through division of labour and introduction of improved farming techniques.

(ii) Through planned use of labour and implements, rural industries could emerge and enlarge their scales.

(iii) Because of the system of income distribution, more people, especially women, were brought into agricultural production.

Even before collectivisation had stabilised, the "Great Leap Forward" began immediately in 1958 and, during the next two years, almost all forms of private property were abolished and a system of payment according to need was introduced. The production unit was organised into very large communes in which unified management by command was adopted. Unfortunately, this bold exercise in changing the institutional structure of production failed and caused grave damage to the rural economy of Ningnan. To a great extent, the development path of Ningnan county was set back for several years.

The impracticality of this experiment was recognised in 1960. The production units were split from commune into production teams (based on village or group of neighbouring residential sites), and the commune became the essential (lowest level) government organ. From 1960 to 1976, a three-level rural production structure -- commune - brigade - production team -- prevailed. Farmers received income on the basis of work point systems

(payment depended on the ability of labour and working days contributed). The brigade was responsible for making links, from commune to production team, and for running small-scale industrial activities, as well as primary schools and rural medical clinics. The commune played the key role in resource allocation and mobilising seasonal unemployed labour for farm capital construction projects. Through the savings by commune activities, the commune facilitated the management of industries that required higher investments. The private sector was carefully controlled, about five to seven per cent of the land was allocated to households for private use. Although the sizes of private land were small, they were regarded as very important for ensuring the farmer's livelihood. Farmers gave sufficient input to their own land to produce vegetables, fruit, economic plants, or cereal crops. The household economy began to be attractive.

No sooner had agricultural production in Ningnan county begun to recover, then the "winds" of "cultural revolution" (1966-1976) began. Agriculture was forced into a one-crop dominated production system. Cereal crop production was treated as the major activity, while other activities, such as cottage industry, sideline activities, transportation, business, etc were considered to be "the tail of capitalism" which needed to be cut off. The diversified resources in mountain areas of Ningnan were misused. For example, in order to have more cultivated land for planting grain, many forests were cut down and many pasturelands were destroyed. Consequently the environment was damaged, neither did newly reclaimed land help increase crop output. From 1949-1976, the economy of Ningnan county, as a whole, developed very slowly (the output value of industry and agriculture grew at an annual rate of 4.8 per cent).

1977 to 1990

This stage started soon after the issuance of the new policies on rural economic development were issued. The following are the major features of the new policies.

Flexible Policies. A significant policy adopted after 1978 is the decentralisation of decision-making in rural production through the restructuring of production units. The management system of the rural economy shifted from a work-contract responsibility system, to an out-contract responsibility system, and then to a household responsibility system. From 1982 onwards, the household responsibility system policy stabilised. The county government has declared that - (i) the household responsibility system policy will not change for several decades; (ii) that private family lands can be maintained for a long time; and (iii) that the ownership of trees on mountain slopes can be kept by those contributing to their plantation. Under the "responsibility system", farmers are encouraged to derive more benefit from both their contracted land and private land through hard work. This has led to the emergence of a diversified rural economy.

The pricing policy for agricultural production has also been readjusted. Under this policy, not only has the purchase price of agro-products been raised, but also a purchase pricing system (including a quota purchase price, over quota purchase price,negotiated price, and market price) has been established. Once farmers sell a certain amount of their products at a quota price (the amount depends on the contract agreement) to the State, they can sell the rest of the surplus products at any price they like. Since then, rural markets have become animated. The rapid development of markets has played a very important role in

breaking the isolation of mountain areas. Enormous economic benefits can be gained by using the abundant resources and specific 'niche' of local resources found in the mountains. With this kind of stimulation, commercial development in Ningnan improved speedily.

Since 1980, priority has been given to the development of science and technology. While the government has created conditions to attract outside scientists and technicians to work in Ningnan, it has also encouraged local people to be involved in development programmes.

Rapid Development of Agro-based Industry and Commercialisation. A regional planning group (including leaders of the government, scientists from both inside and outside the county, and farmers) was organised in 1979. After three years of survey and analyses, a system of development strategies was formulated in 1983. Based on the "Agro-resources Survey and Agro-regionalisation of Ningnan County",[3] an integrated development of agriculture and agro-based industry has been initiated. By 1990, besides grain production, sugar production, silk yarn production, tung oil production, and pig raising had became leading sectors in the county's economy.

In 1990, the output value of agriculture and industry doubled that of 1976, the average net income per capita reached 511 *yuan*, and more than 99 per cent of the households had been relieved from poverty.

4. Indicators of Transformation

Indicators in Terms of the Economy

Tables 1 to 6 give a general picture of economic changes in Ningnan county between 1950 and 1990. The key features of these changes are given below.

i) The economy of Ningnan as a whole has grown very fast, compared to Yi Prefecture and Sichuan Province, particularly after the reforms of 1976.

ii) Agriculture still plays the leading role in the economy, but agro-based industries have an increasing share in the county's economy. Also the growth rate in industry has been much faster than in agriculture. The rapidly growing, agro-based industrial activities include sugarcane, silkworm raising, tobacco, and vegetables.

iii) Benefitting from the development of industry, the Ningnan government has been able to allocate more investment to agro-construction which, in turn, ensured the raw material requirements for the development of agro-based industries.

[3] This work received the Science/Technology Achievement Award of Sichuan Province in 1986.

Table 2: Growth Rate in Gross Output Value

	1950-65	--1975	--1980	--1985	--1990
Ningnan County:					
Agriculture	5.94	1.85	7.90	7.25	3.65
Industry	7.50	13.76	22.08	11.70	11.26
Yi Prefecture:					
Agriculture	6.19	6.20	5.59	14.50	4.30
Industry	18.61	11.04	10.80	11.78	8.02
Sichuan Province:					
Agriculture	3.27	5.76	6.88	13.71	4.15
Industry	14.44	10.40	12.69	12.47	11.23

Note: Calculated at 1980 constant prices

Indicators in Terms of the People and Their Lifestyles

Reviewing changes in terms of people's lifestyle from 1950 to 1990 (Tables 3 and 4), we can draw the following conclusions: i) in the last 10 years, living standards in Ningnan county, on the average, have essentially improved; ii) foodgrain availability has shown tremendous improvement since 1980; iii) public facilities in Ningnan county have improved significantly; and iv) off-farm employment has become a stable and major source of absorbing rural surplus labour.

Table 3: Population and Economic Resources

	1950	1965	1975	1980	1985	1990
Ningnan County:						
Population (in 10,000)	7.21	8.95	12.86	13.50	14.23	15.20
% of rural population	97.40	92.90	94.20	93.40	92.60	92.80
Growth rate %	-	1.45	3.65	0.98	1.06	1.33
Net income per capita (*yuan*)	-	-	63	130	339	511
Grain available per capita (kg)	220	383	305	441	472	421
Per capita gross output value (*yuan*)	121	235	225	363	520	668

Note: the net income per capita of Ningnan county is calculated at current prices.

Indicators in Terms of Production

Since 1976, growth in agricultural production has more or less stabilised. Vegetable, fruit, sugarcane, and tobacco production have increased rapidly (Table 5). Agriculture is being modernised (Table 6). In industry, hydropower generation and production of sugar and its by-products have become leading activities. The improvement in agriculture is closely linked to the readjustment of land-use patterns. While land area under crop production has decreased, land under commercial crops has increased. Land reclamation and improvement of productivity have contributed to the increase in production.

Table 4: Public Facilities (Ningnan)

	1960	1970	1980	1990
Highways (km)	-	-	489	1319
Road density (km/100 sq. km.)	3.7	9	49	78
Subcounties linked with roads (%)	8.3	20	83	100
Villages linked with roads (%)	3.5	8.4	45	76
No. of post offices	5	8	8	7
No. of state markets	39	72	76	104
No. of hospitals/clinics	31	31	31	30
No. of medical doctors	117	158	434	372
No. of hospital beds	68	141	160	312
Govt. input to public health (10,000 *yuan*)	4.9	21.8	49.9	76.1
County broadcast coverage	-	-	51.1	58.0
Teachers in primary and secondary schools	350	628	1055	992
Farmers trained (*1,000)	5.1	1.3	13.7	87.4
Skilled labour in off-farm employment	-	-	2089	3606

Table 5: Agricultural Production in Ningnan

	1950	1960	1970	1980	1990
Grain crops:					
Production (T)	15445	22440	36800	55610	59430
Productivity (T/*mu*)	0.10	0.12	0.18	0.25	0.32
Vegetables:					
Production (T)	185.4	900	1650	2054	20792
Productivity (T/*mu*)	1.8	2.0	2.2	2.4	2.5
Fruit:					
Production (T)	84.6	92.0	154.3	308.5	1844.4
Productivity (T/*mu*)	0.10	0.10	0.11	0.51	1.00
Oil crops:					
Production (T)	284.9	709.7	47.9	488.0	365.0
Productivity (T/*mu*)	0.03	0.04	0.04	0.07	0.09
Sugarcane:					
Production (T)	3183	2152	21041	69510	213853
Productivity (T/*mu*)	2.41	1.35	3.90	4.50	5.03
Tobacco:					
Production (T)	11.1	84.3	6.8	1.0	700
Productivity (T/*mu*)	0.02	0.06	0.05	0.07	0.12
Reference productivity of Yi prefecture:					
Grain crops	0.09	0.10	0.14	0.20	0.29
Oil-bearing crops	0.02	0.03	0.03	0.04	0.05
Sugarcane	2.67	1.44	3.40	3.75	5.10
Tobacco	0.05	0.04	0.05	0.10	0.11

Note: 1 hectare equal to 15 *mu*

Table 6: Indicators of Agro-Modernisation

Sector	1950	1965	1975	1980	1985	1990
Ningnan County:						
% of land with guaranteed irrigation	7.8	21.5	34.7	40.0	42.0	45.0
Fertiliser use kg/*mu*	-	2.5	8.5	19.9	22.6	35.5
Electricity use kw/*mu*	-	-	6.6	17.3	21.4	18.9
Agro-machine kw	-	220	3200	8480	11860	16592
Agro-machines/1000 *mu*	-	1.0	13.9	34.8	53.3	67.0

In 1990 Ningnan produced 20,877 tonnes of sugarcane, 2,088 tonnes of industrial alchohol, 91 tonnes of reeled silk, and 40,500 tonnes of cement among its major industrial products.

Indicators in Terms of Environment

Economic growth and environmental protection are important principles underlying Ningnan's development strategy after 1976. With the promotion of biogas, solar energy, afforestation, terracing, irrigation, etc not only have the environmental conditions of Ningnan county improved but also the value of resources has been upgraded.

In terms of the environment i) conservation of water and soil has been perceived as the key link in environmental conservation in Ningnan; ii) programmes have focussed on the problems which cause environmental degradation - solar energy, biogas, and small hydropower developments are ways and means to reduce deforestation; and iii) environment and economic development are closely related - environmental protection provides enhanced inputs to economic development.

The achievements in water and soil conservation are shown in Table 7.

Table 7: Achievements in Water and Soil Conservation (1980-1991)

Achievements	Indicators
Drainage embankments	2 total length 3781 metres
Dams	3 protected 2077 *mu* of land
Terracing	3930 *mu*
Protected forest	93409 *mu*
Artificial grass cultivation	24960 *mu*
Drainage channels	163 km
Water tanks	115 water storage capacity, 255,000 cu.metre
Repairing channels	105 km
Investment	11.01 million *yuan*, out of which 82 per cent were invested by local government and collectives of farmers

Source: Office of Water and Soil Conservation, Ningnan County

5. Factors of Transformation

The key factors in the transformation witnessed in Ningnan after 1978 can be grouped into three categories: (i) policy and management; (ii) science/technology; and (iii) integrated environmental conservation.

Policy and Management

Policy changes after 1978 gave a free hand to the counties. Ningnan could therefore undertake reforms in its own way. After the policy changes, the county government decided to restructure the production system on the basis of the local situation, based on an intensive survey of resources by different levels of leaders and scientists. The strategic thrusts were as follows.

a) Agricultural resources are the fundamental source of the county's economy, so with foodgrain self-reliance, multi-activities in agriculture should be encouraged.

b) Sugarcane, mulberries, and tung oil trees are the promising cash crops and pig raising has substantial potential. These four components should be the leading sectors. In addition, tobacco production activities, subtropical fruit production, agro-production processing, economic trees, and animal husbandry should be given due emphasis.

c) The county should move from a "natural economy" to a "commercial economy". In doing so, agro-based industries should grow more rapidly, because these can have comparative advantages in the commodity market.

d) The introduction of the "responsibility system" notwithstanding, the management of development should be under overall planning. Major activities should follow the guidelines of development strategies.

e) For sustainable development, while emphasising economic benefits, ecological impacts also need to be evaluated, and environmental conditions should be properly protected and conserved for future generations.

In the pursuit of an effective development strategy, management played a very important role. First, the leadership of the county government always supported the strategic plan. Between 1976 and 1990 county leadership changed four times. In spite of the changes, Ningnan was able to pursue a constant strategy. There are three principal reasons for this. One is that most of the governors and leaders were promoted from practical positions in which they had several years of experience in regional development. They not only knew the real meaning of the strategy, but also the ways to carry it out. The next reason is that leaders were able to draw lessons from past failures. They realised the negative impacts of frequent changes on policy and strategy (before 1976) and believed that the development strategy must be based on local background and knowledge. The third reason is that leaders in recent years have been selected based on both ability and knowledge and not solely on political criteria. Nowadays, most of the leaders at county level have at least 10 years of experience in Ningnan and have a college level degree.

Second, the contracting mechanism has made management more effective. Since 1976, and more particularly after 1980, the government coordinates integrated development programmes, and the county governor and related leaders are responsible for organising institutions participating in the projects. The project proposal needs to be discussed with related institutions before the project starts. Once the project is approved by the people's committee of the county, work is contracted to related institutions (conditions of the contract, including leadership, work, target budget, period, and quality of the work). During and after the project, monitoring and inspection are routinely carried out and an award/punishment system is implemented, depending on the work done, under the monitoring of the county (or sub-county) leaders. The contracted project becomes a yardstick for measuring the ability of leaders in different institutions and at different levels. Those who perform well in terms of project work continue to remain in leadership while others are replaced. As a result, new blood has entered the leadership at all levels. Third, development planning has guided the integrated exploitation of natural resources. An integrated resource survey was started in 1978, and a regional plan drawn in 1983. In the five years from 1978 to 1983, the development strategy and the goals to achieve it were gradually unfolded.

The Regional Plan drafted in 1983 set development priorities, identified spatial as well as sectoral areas of development, prioritised implementation, and charted a course for integration. Guided by this regional plan, Ningnan underwent a transition from extensive development to intensive growth. The major achievements are as follows.

In accordance with mountain environmental conditions, a diversified land-use pattern and agro-production bases were gradually established (Table 8). Economic plant cultivation increasingly contributes to both economic growth and ecological conservation.

Table 8: Altitudinal Production Bases in Ningnan

Altitude	Leading Sectors
585-1300masl	Rice, sugarcane, mulberries, subtropical fruit, vegetables
1300-1800masl	Grain crops, tung oil tree, mulberries, tobacco
1800-2500	Grain crops, economic trees, grass-fed animals
> 2500	Timber trees, grass-fed animals, medicinal herbs

This new production structure generated more off-farm employment opportunities and farmers benefitted from adoption of these planned programmes. This encouraged peoples' cooperation in programme implementation.

Science and Technology

The widespread application of science/technology has played a key role in the transformation of Ningnan county. In promoting science and technology, the county government adopted two measures. The first measure was to attract outside scientists and technicians to work in Ningnan. While absorbing outside scientists, new technologies were also absorbed. The second, and the most important measure, was to rely on local

scientific/technological capability and to develop programmes in accordance with the mountain environment. The living and working conditions of scientists/technicians were improved, an award system was instituted, and people were sent outside to study. This emphasis on science and technology brought about a remarkable rise in labour productivity and land productivity.

After 1978, with the adoption of the "household responsibility system" the production units have been quite small. As a result, extension has been more complicated. Also, due to varied environmental conditions, the extension of technology has also to be varied, but the constraint is that of limited manpower. With these problems in mind, Ningnan county has adopted a two-way approach. One way is to develop programmes at county or sub-county level in accordance with the regional plan and encourage production groups or households to implement them. Another way is to formulate programmes (including demonstrations) based on the interest of farmers.

Attempts were made to strengthen the science/technology service system by establishing agro-service stations manned by trained staff in all the sub-counties. To make the science/technology service effective, a contracting system, i.e., giving a certain payment to the service in accordance with the increment of output, as implemented. With the introduction of the "responsibility system", farmers have realised that the households' capability in improving technology is limited. Some farmers (households) started collectively contributing funds to improve production technology and set up associations. The county government has encouraged this kind of collective work. All of the sub-counties in Ningnan have science/technology associations, and rural collective foundations. Many specific associations, such as the vegetable, sugarcane planting, mulberry and silkworm raising, fruit, rural energy, and silk reeling associations have been the centres of information, experience exchange, and local training.

In Ningnan, the first priority was the promotion of labour-intensive technology and then, wherever feasible, the adoption of intermediate and advanced technologies.

To overcome the constraint of the inaccessibility of information, Ningnan established an information centre. The staff members of the centre are responsible for collection and dissemination of information from internal and external sources and develop proposals suitable to Ningnan's environment. In addition, the county hired 35 experts from universities and research institutes in big or middle-sized cities in Sichuan Province as information advisers. These advisers stay in their home cities, travel sometimes to Ningnan, and provide the latest information of relevance to Ningnan's development.

To overcome the weakness of technology in the county, Ningnan invites experts from outside to guide the improvement of technology in accordance with actual needs. For example, to improve the quality of silk reeling, Ningnan joint silk reeling mill invited eight experts from Chongqing, Chengdu, and Suining cities. In two years with the guidance of these experts, silk reeling was substantially upgraded. To develop the tobacco-processing technique, Ningnan invited 16 outside experts to give overall guidance. So far, about 70 per cent of the processed tobacco in Ningnan has a good market due to its high quality. Similar examples exist in other areas.

Extension through training and demonstration has been emphasised. Each technician at county and sub-county level is required to train five households in specific production areas. This regulation, aimed at strengthening the relationship between technicians and farmers, has proved to be effective. By 1990 there were more than 3,000 households that had became "specialised households". About 50 per cent played the role of "demonstration (or other activity) farms" influencing their neighbourhoods. Many farmers serve outside their villages or even outside the county in dissemination techniques. For example, many specialised farmers grouped together and went outside Ningnan to construct biogas tanks as an off-farm employment endeavour.

Basic Construction for Sustainable Development

It has gradually been recognised that the resource base, which ensures the sustainable supply of products, should be conserved. Construction and maintainance of basic infrastructure are important concerns in this regard. The emphasis has been on the following.

Agricultural Infrastructure and Land Management. When the "responsibility system" was adopted, farmers were enthusiastic about higher production, but the basic agricultural infrastructure was ignored. Several policies were then implemented. Under these policies, farmers were encouraged in land management, land reclamation, and environmental regeneration. These policies enabled farmers to undertake a wider range of land management activities. Between 1978 and 1988, 18 thousand *mu* of land was reclaimed and 300 thousand *mu* afforested in Ningnan county.

In 1988, the Department of Land Management was established. In addition, legislation on land management was also approved. A number of initiatives in the development of wastelands was taken through planned resettlement. Under planned programmes, between 1988-1990, more than nine thousand *mu* of land was reclaimed, more than 20 thousand *mu* of land was terraced, and the land/water conservation area increased to 117sq.km. in Ningnan.

Lack of funds is a key constraint in basic land development. In addition to providing financial support through government funds, agro-processing industries are required to provide a small percentage of their net profits for the construction of agricultural infrastructure. Villages and collectives are also required to share the costs.

Afforestation. Afforestation is a key measure for protecting the environment from soil erosion. Following the reforms an afforestation campaign was launched. The financial and material resources of both the State and the collective were directed to places where afforestation needs less investment but produces quick results, and a high survival rate is ensured by favourable natural conditions.

Since 1980, a two-system approach for afforestation has been adopted. One system is afforestation on State-owned land. Under this system, the funds came from the State and the forests belonged to the State as well. In another approach, State- owned lands were contracted to collectives for afforestation. On the contracted land, trees belonged to those

who planted them. By 1990, the forest cover in Ningnan hit the 23 per cent mark, which was higher than the average for Sichuan Province (19.7 per cent) and China (14 per cent).

Road Construction. Road conditions and the transportation capacity in Ningnan was extremely poor before 1976. About 80 per cent of the sub-counties, and more than 90 per cent of the villages were without highway connections. Roads were blocked very often by landslides. Sometimes Ningnan was isolated from the outside for a period of more than six months. After 1976, road construction was given priority. A large-scale road construction programme was started in 1987.

Investments for road construction were mobilised in a variety of ways: (i) subsidies from provincial and prefectural governments for constructing and maintaining roads within the county; (ii) contributions for road construction from development programmes: for example, the hydropower programme was required to allocate a certain budget for road construction in selected areas; and (iii) contributions from enterprises for road construction: for example, three of the sugarmills invested three million *yuan* for road construction in rural areas where sugarcane is produced.

In addition, a system of matching funds (between government construction investments and affected communities) has been instituted and taxation for road construction is also used to mobilise funds.

6. Lessons from Ningnan

Ningnan as a Transformation Model

The lessons emerging from the experience of Ningnan may be summed up as follows.

Basic Needs. In mountain areas, feeding the population has all along been a problem of primary importance. Self-reliance, especially in foodgrains, in mountain areas, is therefore the first priority of development. Only when cereal crop production meets the requirements of the people can further development be possible.

Technological Inputs for Integrated Agriculture. Mountains have limited cultivable land. With a rising population, increase in production requires a high technology input. By introducing high-yielding varieties, increasing the multiple-crop index, and adopting suitable technologies and management, it is possible to expand the sown area and to increase the yield. Besides foodgrains for survival, the next priority for mountain people is cash income. So, it is necessary to develop integrated agriculture by using diversified resources. In the mountains, labour intensive technology, indigenous methods, and small-scale approaches need to be emphasised in the early stages of development.

Ecological Conservation through Exploitation of Alternate Energy Resources. Natural resources are the foundation of mountain life. Conserving the mountain environment, to a great extent, is protecting the life of the people. In mountain areas, fuelwood collection is a serious problem causing environmental degradation. Solar energy, biogas, small hydropower, etc are very promising resources in mountain areas. Exploitation and

utilisation of these resources helps environmental conservation and also contributes to improvement in people's lifestyles.

Agro-based Industries. As mountain agriculture develops, agro-processing needs to be emphasised because it provides employment and contributes to value-added.

Stabilisation of Agriculture and Industry through Infrastructural Improvements. To stabilise the mountain economy, improvement of the infrastructure plays a very vital role. However, constructing infrastructure is more difficult and more costly, but it is worthwhile as long as it is possible. Construction is costly in the mountains, so it has to be linked to multiple-financing mechanisms.

Commercialisation. Products having a comparative advantage in mountain areas, such as silk, tobacco, tung oil, medicinal herbs, off-season vegetables, fruit, etc can compete effectively in the plains. In the process of commercialisation, the key issue is to realise the comparative advantages and link with the markets.

STRATEGY FOR DEVELOPING THE INDUSTRIAL ECONOMY IN THE DABIESHAN MOUNTAIN AREA

Zhu Kaihua
Zhang Guoping
Hang Xiaoshu

Dabieshan mountain area lies in the border region of the Anhui, Hubei, and Henan provinces and is one of the most poverty-stricken parts of China. The region has an area of 74,500 sq. km. and a population of 2.5 million. It also has a great potential for industrial development. This paper discusses the strategy for the development of the industrial economy in the Dabieshan area.

1. Analysis of the Regional Environment

Dabieshan mountain area has a unique geographical location. Surrounded by Hefei, Anqing, Jiujiang, Wuhan, Zhengzhou, and other cities, this area has access to markets and transport networks.

As far as transportation is concerned, the Beijing-Guangzhou railway line runs across this area from north to south through Beijing, Zhengzhou, Wuhan, Guangzhou, and other large cities and small towns. A highway network, consisting of national and provincial highways, links much of the Dabieshan mountain region.

In addition, the region has also the convenience of shipping transportation which covers more than 200 miles from Wuhan and Chongqing to Nanjing, Shanghai, and other cities. These provide favourable conditions for developing an open economy. Dabieshan mountain area also has a large pool of cheap labour.

In spite of these distinguishing features, Dabieshan mountain region has not been able to capitalise on its advantages. In 1986 the Chinese government singled this region out for focussed development assistance. As a result, an industrial development strategy was carefully formulated and implemented and a network of complementary industries was promoted to improve the economy of the whole area. Today Dabieshan mountain area has received aid and cooperation from a number of countries and international organisations.

2. Analysis of the Industrial Economy in the Dabieshan Mountain Area

The following are some of the major areas of industrial development in the Dabieshan Mountains.

1. Tea production and processing in Huoshan county of Anhui Province.

2. Production, supply and marketing of cocoons, and processing of silk yarn and silkcloth in Jingzhai county of Anhui Province. This is combined with mulberry planting, raising silkworms and production of cocoons, and a silk cloth firm, which

integrates silk cloth production with printing, dyeing, clothing, and embroidery. Two companies have cooperated and developed in a complementary fashion. Silk processing and production is the key industry in this county.

3. Production of artificial mushrooms in Yuexi county of Anhui Province.

4. Raising and production of white geese in Luan County in Anhui Province. West Anhui White Geese Industry Association, consisting of the peasants who raise geese, administrative cadres, technicians, factories processing geese products, and those related to scientific research, marketing, banking and trade, unifies geese reproduction, processing, and marketing into a network.

3. Measures Suggested for Further Development of the Industrial Economy in the Dabieshan Mountain Area

In order to further develop the industrial economy in Dabieshan, the following measures are suggested.

Management Reform

The present management system has to be reformed in order to bring about efficient and timely application of technology, capitalise on local resource advantages, and remain competitive in the market. Joint ventures and contractual joint ventures should be promoted. Emphasis should be placed on human resource development.

Policies Favouring the Growth of the Industrial Economy

The development of the key industries should be guided and supported through State policies. Policies with respect to credit, prices, tax revenues, manpower, and science and technology should be improved quickly. The credit policy should give preference to complementary investments. The pricing policy should help entrepreneurs bear the risks associated with market fluctuation, and the tax policy should encourage local capabilities in capital accumulation and investment.

Building Up Basic Infrastructure

Basic infrastructure (such as transport, water power, energy, and post and telecommunications) has a significant part to play in improving the production and living conditions of the masses in mountainous areas. These also determine the extent to which accelerated industrial development can take place. Basic infrastructure should therefore receive first priority.

Strengthening the Complementarity between Industries

Insufficient attention has been given to the planned development of complementary industries. It is therefore necessary to analyse and promote the relationship between key (or pillar) industries and basic industries, such as grain and forestry, and the relationship between industrial structure and technology packages.

SELECTION OF AN APPROPRIATE INDUSTRIAL STRUCTURE MODEL IN MOUNTAIN AREAS

Zhou Zhixiong
Tang Hepin

1. Comparing Economic Conditions in Mountain Areas with Those of the Plains

In comparison to the plains, a number of factors act as constraints to economic development in the mountains. The first constraining factor is the lack of transport facilities. Transport costs are high, which means that the competitive ability of products is reduced. Farm and sideline products lack access to markets. A commercial economy cannot thrive without good transport. No transport means delayed information transmission, no information on technology, and no market information.

The second constraining factor in mountain areas is the shortage of cultivated land. People in mountain areas usually dwell along river valleys because of access to cultivated lands. But, with the rise in population, cultivated land per capita is decreasing. The serious soil erosion situation in the Sichuan Basin, Taishang mountain area, and Luliang mountain area is closely connected to ecological degradation as a result of population pressure.

The third constraining factor is the shortage of trained people. Technical personnel are unwilling to go and stay in mountain areas. People educated in mountain areas are also unwilling to stay and work in mountain areas.

Mountain areas are also prone to natural disasters.

However, mountain areas also provide a number of advantages. First, relative closure and insularity may provide advantages in crop breeding because the possibility of impurity caused by hybrids is greatly reduced. Mountains can also be free of epidemic diseases. Even though transport costs may be a little higher, total benefits may actually be greater.

The second factor is the unique climate of mountain areas. Mountains have stereoscopic climatic zones. Diversity provides a comparative advantage in the production of a variety of crop, fruit, and vegetable products. Apples and pears in south China and citrus fruits in north China can all be produced in mountain areas. Differences in the day and night temperatures in mountain areas are great, athough accumulated temperatures are relatively low. Because of adequate sunlight, plants there have long growth periods, fruits have rich nutrition, and they taste good. Compared to the plains, in the mountains farmers can take advantage of the season and produce off-season farm and sideline products for the markets.

The third advantageous factor is the relative richness in resources in mountain areas. Generally speaking, mountain areas are rich in mineral resources. Minerals can be the basis for the processing industry. A successful example is Zuoyon county in Shanxi Province. Good use can be made of rich water resources in mountain areas to build small hydroelectric stations. Also plant resources can provide the basis for developing the processing industry. Labour is cheap in most mountain areas and this lowers the price of goods and services accordingly.

2. Industrial Structure Model for Mountain Areas

Based on the superior advantages of mountain areas, two industrial structure models for mountain areas can be proposed.

The first model is to develop the local economy by exploiting mineral resources (including extensive processing), by processing famous and fine local products and by developing tourism. This strategy is suitable for places where there are rich mineral resources, a tradition of fine local products, and good scenic spots. Because of the transport problem, most mountain areas have no obvious superiority in mineral products. Mineral processing is capital-intensive and mountain areas are short of capital. The lack of transport makes outside inputs costly.

Therefore, new industrial projects to be set up in mountain areas must possess the following characteristics.

(i) Raw materials should be available locally and processing should decrease the weight or the volume of industrial products.

(ii) Industrial products should be saleable mainly in local markets.

(iii) Superior traditional technologies and management capabilities.

The second industrial structure model suitable for mountain areas is one based on environmental regeneration and planting. Only those areas with convenient transport can go in for processing.

These two industrial structure models are exemplified in Dong Mao Wuan and Liu Chuan Zi villages.

Dong Mao Wuan and Liu Chuan Zi are villages in the north mountain areas of Huai Rou county. Dong Mao Wuan is located at the confluence of the Bai and Tang rivers. It has transport facilities. The average cultivated land per capita is one *mu*. Peasants there took the advantage of convenient transport to set up four small enterprises, namely, a brickyard, a processing factory for tin and steel, a chicken farm, and a comprehensive processing factory; in addition there is a hydroelectric station. They also sow maize and wheat in the river valley. The average income per capita was 1,600 *yuan* in 1991. It was higher than the average level of the rural areas of Beijing.

Liu Chuan Zi is located to the east of Bao Shon Shi Xiang. The average cultivated land per capita is less than one *mu*. Compared to Dong Mao Wuang, Liu Chuan Zi has poor natural and economic conditions. There are no enterprises. The average income per capita was 950 *yuan* in 1991. But the hills provide a comparative advantage in the production of fruits such as apples, chestnuts, apricots, etc. Liu Chuan Zi village has been able to prosper in recent years as a result of its emphasis on horticulture.

3. Promoting an Appropriate Industrial Structure in Mountain Areas

The second type of industrial structure model is more appropriate for mountain areas. A number of measures may, however, be required to promote this model.

First, with the adjustment of the industrial structure, the investment structure must be adjusted correspondingly. Cadres in mountain areas sometimes say "pay attention to the forest and fruit trees in the long term, pay attention to animal husbandry in the short term". This shows that the production period for forest and fruit trees is long and more capital is needed. In addition, forest and fruit trees occupy an important place in the second type of industrial structure model.

In terms of using capital investment efficiently, the principle of "unified management and centralised investment" is appropriate. The advantage of labour should be derived by substituting labour for capital wherever possible.

With adjustment of the industrial structure, the technology structure in mountain areas must be adjusted correspondingly too. In order to take advantage of abundant labour resources, a labour-intensive technology must be imported. Training local people must be a key concern. Because of poverty, talented people are unwilling to stay in mountain areas for long. Therefore, conditions must be created to attract professionals from outside.

Adjustment of the industrial structure in the mountains must be seen as part of a transformation process for mountain economies from closure to openness, from self-sufficiency to commerce. Therefore, not only ideas but also infrastructure such as roads, electricity, water, and the necessary service facilities all need to be improved.

THE UTILITY FUNCTION OF GRASSROOT CADRES IN POOR RURAL AREAS AND THE POSSIBLE IMPACT ON ECONOMIC DEVELOPMENT

Wu Guobau

The present paper discusses the utility function of township and village cadres and analyses the possible impact of cadre on economic development.

1. General Utility Function of Township and Village Cadres

There are some differences of utility function between township and village cadres and between different kinds of township cadre due to differences of position and the facilities, including pay, provided to the cadres.

For the purposes of this analysis, we make three basic assumptions. First, improvement of the social status of township cadres depends on their promotion. Second, cadres behave rationally. Third, appraisal standards for the promotion of township cadres by higher authorities are based on justice and equality.

The promotion of township and village cadres depends on three criteria. First, the index of task accomplishment. This includes how long and how fast the tasks assigned at different times are carried out. The contents of these tasks are usually stated very clearly, for instance, the popularisation area for a certain crop, numbers of women of child-bearing age who undergo IUD insertion, and so on. Second, the index of economic development, including net income per peasant in the entire township, the total output of food crops in a year, and the numbers of families and persons whose incomes are below the poverty line, etc. Third, the index of social development, such as rate of crime, social security, population growth rate, and the number of children attending schools. The second and third indexes, unlike the first one, are not stated clearly and directly.

The general utility function of township cadres, f(U), is to maximise the index of task accomplishment, the index of economic development, and the index of social development or,

$$f(U) = (ax + bY + cZ) ---- \max$$

where,

Y and Z represent the matrix of the index of task accomplishment, the index of economic development, and the index of social development respectively. This general utility function mainly applies to the leading township cadres and the ordinary cadres whose family members are employed by government organisations. It does not apply to temporary cadres, contract cadres, and cadres whose family income mainly comes from non-government organisations.

Because of the backward economic situation and limited local revenue, there are a large number of temporary and contract cadres in poor rural areas. There are big differences in position stability and welfare between these cadres and regular government cadres. The actions of the temporary and contract cadres are subject to the same general utility function as regular government cadres. The improvement in their social status is realised through promotion (it is different from the promotion of other cadres. The temporary cadres are promoted to contract cadres. The contract cadres are promoted to regular government cadres).

2. The Impact of Cadres on the Economic Development of Poor Areas

The following analysis is based on field investigations of the relationship between the grassroots' cadres utility function and economic development.

Field investigation in the townships of three poor counties and a survey of township cadres reveal that the task fulfillment index is the first and primary element by which higher organisations assess township cadres in poor rural areas. There are three reasons for this: first, the various task items that higher organisations pass on to townships are generally concrete. Usually, after a specific task is assigned by county or district organisations to townships, a summing-up meeting will be held by the scheduled deadline to assess how a certain task has been fulfilled by different townships. Second, the time period is emphasised in fulfilling tasks. Usually a specific date is set for a task to be fulfilled. To fulfill the assigned task the cadres may even give up more significant economic development work. Third, township cadres in poor rural areas are kept busy all year round by various specific tasks. The regular workload of township cadres by season, in addition to incidental work, is shown in Table 1.

Table 1: Seasonal Arrangement of the Work of Township Cadres

Spring	Summer	Autumn	Winter
Arranging activities for villagers during the Spring Festival; distributing relief grain and materials; planting trees, birth control; distribution of relief money	Arranging for the the harvesting of spring crops and the planting of summer crops; urging villagers to sell contract grain; population issues	Arranging for the harvesting of summer crops and the planting of autumn crops; collecting deductions and unsold contract grain; and birth control	Collecting deductions and agricultural tax, basic farmland construction; land cultivation for afforestation for the next year; and birth control

Higher organisations assign a significant assessment coefficient to the task fulfillment index in township cadres' general utility functions. The result is that relationships between township cadres' behaviour and economic development depend on the township cadres' willingness and ability to turn specific tasks into measures that are favourable for economic development. Many of the specific tasks that higher organisations assign to townships are measures to develop the economy, e.g., afforestation, basic farm field construction, popularising new technology and agricultural systems, and economic development programmes to alleviate poverty. These specific tasks usually are what

higher organisations think to be the best measures to speed up economic development. Because higher organisations cannot really have a comprehensive understanding of actual situations in each township, economic development measures sometimes can have disastrous effects. For example, a county, in order to reduce its financial deficit, planned to build a cigarette factory which had a high tax rate of production. The county asked townships to use their special loans for the poor area in growing tobacco in farm fields in areas chosen by the county. The result, however, was that farmers suffered losses because of low production and the higher cost of tobacco production, and the factory itself fell through due to lack of raw materials. However, many of these economic plans and tasks which higher organisations pass on to townships can be turned into effective measures to develop the local economy, given reasonable decisions by township cadres.

Economic development measures and tasks, which higher organisations assign to townships, can be divided into three types: the first consists of measures that completely fit local situations and, which when implemented, will benefit the local economy. The second encompasses flexible measures. For example, in 1987, a higher organisation assigned a township the task of planting 100 *mu* (6.6 hectares) of apples, but township cadres thought that the local soil was better for haws and, after consulting the departments concerned, they planted 100 *mu* of haws. In addition to fulfilling the task of developing fruits, they provided local farmers with a better economic opportunity. In China's poor rural areas, production plans are supplemented by quotas for rare resources (such as fertilisers at fixed prices, diesel oil, etc). The third type consists of measures that do not fit local situations and which are not flexible. However, township cadres can try to reduce the number of such tasks. In poor areas, many tasks are assigned at meetings. When the assigned task does not fit the local situation, township cadres at the meeting may present reasons to prove so. This can influence higher authorities to reduce the number of such tasks. Therefore, setting the number of tasks is usually the result of bargaining between higher and lower authorities. Further, when tasks assigned by higher authorities do not fit local situations, cadres can implement them first on a small scale and ask the higher authorities to come for inspection in order to convince them of the unsuitability of such tasks.

Township cadres may take the initiative in developimg the local economy by taking measures which are not within the scope of activities planned by the higher authorities. But, in doing so, there are two possible risks: on the one hand, implementing independent economic development measures may affect the accomplishment of tasks that are assigned by higher authorities and may adversely influence the position and promotion of township cadres. On the other hand, such measures may be risky and invite criticism from higher authorities as well as dissatisfaction from local farmers. This is what inhibits the cadres in poor areas from making independent decisions. The fact is, if township cadres simply carry out assignments given by higher authorities, they will not be punished even if these measures fail, but if they make independent decisions, they may be criticised and even punished if these decisions affect the fulfillment of other tasks (even those unsuitable for local situations), although they might have successfully accelerated local economic development. During our field investigations, we found that when township cadres took development measures independently they sorted out supporting evidence from the documents they had received from higher authorities so that they could use the documents to justify themselves in case their measures failed. The variety of policy sources in poor

areas (due to the existence of multi-leadership) provides township cadres with alternative policies on which to base their independent decisions. Evidently township cadres run fewer risks if they acquire the approval and support of departments at higher levels before taking independent action.

Another way to motivate and enable ordinary township cadres to carry out decisions is to develop township-run enterprises which can employ labourers from the cadres' families (thus increasing the household income of cadres). This is one way of ensuring development of the township and making sure that the benefits of development are shared by cadres' families. Such development can also have an adverse influence on the development of the township economy as a whole (for instance, when large investments do not yield profits and even incur losses).

While they are executors of specific tasks assigned by county and district organisations, village leaders themselves are also decision-makers. Because economic development in poor rural areas poses many difficulties, village cadres have to spend more time and manpower to implement their independent policies. This may even affect their family incomes. Since village cadres are the immediate beneficiaries of successful decision-making, they are likely to make more independent decisions than township cadres. However, village cadres can also confine these decisions/policies within their own families, unless implementation of these policies requires large-scale cooperation. Therefore, whether or not village cadres can develop the local economy, by making reasonable policies in accordance with local conditions, depends not only on their decision-making ability but also on their spirit of self-sacrifice.

3. Policy Implications

Although the rural institutional structure has changed to a great extent after the reforms, grassroots' cadres have been playing very important roles in economic development in poor areas. Village cadres have a dual position as cadres and farmers. This will continue to be a basic characteristic in future Chinese rural grassroots' institutions. The major conclusion that emerges is that, given the utility function of cadres and the way they behave to maximise their social positions as well as incomes, indicators of local economic development should be assigned more weight in cadres' evaluations for promotion than special tasks assigned by higher authorities.

VILLAGE ORGANISATIONS IN POVERTY STRICKEN MOUNTAIN AREAS: A CASE STUDY OF SHANGZHOU CITY, SHAANXI PROVINCE

Liu Wenpu

1. Introduction

Shangzhou is a county-level city in south Shaanxi Province. It has a population of 494,000, including 444,000 rural residents, or 89.9 per cent of the total. In 1988, Shangzhou city was divided into nine districts and 54 townships. When townships were established to replace the communes, village committees were set up to replace the production brigades. In 1988 there were altogether 633 members of the village committees. There were also production cooperatives at the village level.

According to the stipulation of the municipality, there are three paid cadres in a village. They are the party secretary, the director of the village committee (usually called village head), and a copy clerk. A village can have a deputy village head or a deputy party secretary. The cooperative account is concurrently maintained by the village clerk. Cooperative members are also members of the village committee. Almost all villages in the municipality adopt this organisational form.

2. Function and Major Tasks of Village Cadres

Besides the three leading cadres in a village, there are several others cadres with specific responsibilities: a mediation member (to mediate civil disputes), a public security member (to keep public order), a militia company commander (in charge of militia training and helping with conscription), a women's affairs member, and a Youth League secretary. These people have no fixed pay but receive some subsidies. At present these posts have become a mere formality. Most jobs are taken by the three leading cadres.

Village committees have a highly centralised mode of operation, although some division of work exists. The party secretary in Shupazi village of Kanshansi township, for example, was in charge of village industry, family planning, schools, examining and approving of residence land for farmers, granting funds for poverty alleviation, granting relief for families with material difficulties, and public order. The village head was responsible for production, afforestation, mediation of civil disputes, the militia, and conscription. The clerk was in charge of statistics and reporting forms, releasing certificates, and maintainance of the households' register.

In Shangzhou city, a village cadre's responsibilities include (i) relaying and publicising policies issued by higher authorities; (ii) mediating civil disputes; (ii) organising small-scale farmland capital construction such as river embankments and roads; (iii) management and operation of village industries and sideline activities; (iv) family planning; (v) allotting loans for the poverty relief fund (the quota is assigned by townships to villages and by villages to households); (vi) building village elementary schools and

collecting funds for the operation of schools run by the local people; (vii) collecting grains according to contracts and various other taxes and fees; (viii) carrying out production tasks assigned by townships, expediting planting and harvesting, organising the purchase of production inputs such as seeds, chemical fertilisers, and pesticide, organising unified production in some villages - such as harvesting and irrigation; (ix) public welfare - such as arranging facilities for households enjoying the five guarantees; (x) managing public property; and (xi) fulfilling other tasks ordered by higher authorities such as helping conscription, statistics, and report forms.

The above tasks are general and vary greatly between villages. Villages with more stable incomes have a wider range of work. They not only engage in construction of small-scale public production facilities, but also establish more public welfare facilities. For instance, some villages set up kindergartens, train and manage cultural groups, and manage drinking water schemes. Some villages near forests organise tree plantation on uncultivated slopes that are not distributed to households, or build terraced fields. Others organise villages for land reclamation. However, in most villages the village cadres carry out tasks assigned by township governments. It is rare to find villages planning, managing, and implementing programmes independently from the township. Most villages cannot work independently because of the lack of finances.

The chief cadres in the village spend 100 to 200 days in a year working on village affairs, other cadres spend about 10 to 20 days. Most of the time is spent on attending professional meetings held by high-level administrative departments. All the village heads and party branch secretaries we visited agreed unanimously that, compared to the work teams of the People's Commune, the functions of the village organisations have been diminished. In most villages, they act neither as independent and cooperative organisations, nor as farmers' self-governing organisations. Village organisations have simply become agent institutions of township governments.

3. The Dual Status of Cadres

Most of the village cadres had been cadres in production brigades or teams before the reforms were carried out, although there are many new and young cadres appointed who have higher education. A survey of 24 chief cadres (referring to village head and vice heads, party branch secretaries, and vice secretaries) in eight villages in four townships showed that 17 of them had been cadres in production brigades or teams before the reforms. Most of them do not have much experience, except in agriculture. And, as such, they had no idea of what was expected of them in the reform process.

Under the People's Commune System, cadres at the village level were actually isolated from production. Most of them were secretly nominated by the commune, but on paper they were shown to have been elected by the commune members. Their payment was at the same level or higher than those engaged in agriculture, because they were provided with subsidies for loss of farming time so that they could concentrate on implementing the policies of the government. This system ensured a powerful administrative system from the commune, to the production brigade, and to the farm household. But this has changed now. Village cadres now have a dual status. On the one hand, they are still quasi-

officials of the township government; on the other hand, they have to till their own land under the contract responsibility system much like other ordinary farmers. In addition, they may manage their own household sideline production. In the past, their payment and the economic situation of their families were completely dependent on their services in the local government, but now these depend more on the management of their own family economies.

The contribution of cadres' subsidies in family income varies considerably among different areas and villages. Generally speaking, they only account for a small proportion of cadres' family income. The more developed the areas, the less the proportion of cadres' subsidies in their incomes. In backward and remote isolated mountainous areas, the proportions are relatively high. Moreover, if the chief village cadres spend 150 days in village work, their payments are very low in relation to their work loads.

This change in the contribution of subsidies to family income has made cadres similar to other farmers. When certain policies or measures adopted by the government create conflicts between the government and the farmers, they are more likely to support the farmers. Meanwhile, as villages function more and more as agent institutions of township governments, the cadres become the target of conflicts between the government and farmers. Village cadres are often the target of the villagers' wrath.

As a result, it is becoming more and more difficult to carry the policies and measures of township governments to villages and down to farmers. And this is mainly reflected in the weakening of the functions of villages organisations.

At Yangqie town, which is relatively poor, 10 chief cadres were changed during the two years 1988 and 1989: (i) five of them resigned, because they themselves, or their relatives, were engaged in sideline activities, or were discharged because their engagement in sideline activities seriously affected their organisational work; (ii) two of them were transferred because they were too old or too weak to be village cadres; (iii) one was discharged because he was deemed incompetent; (iv) one resigned because he thought that there were too many contradictions in village work and it was difficult to be successful; and (v) one was transferred to an other place. In addition, the cadres worry about coming into conflict with the masses.

4. Position and Rights of Village Cadres

Village cadres in general still have higher social positions. In spite of the conflicts, the cadres still have better relations with the masses and are respected. Problems such as civil disputes and social and economic and public-work related issues fall in the domain of the village cadres.

After reform of the commune system, the economic power of the village cadres has weakened, but they still control the funds to a certain extent. Although cases of corruption, stealing public property, and embezzling public funds occur much less in rural areas than in cities, such instances still show that village cadres have a number of privileges. In the villages that have village enterprises and more income, village cadres usually have financial power. In other villages, the cadres and their relatives have more

opportunities. They are preferred for jobs, in joining the army, and in getting loans granted for poor rural areas. Moreover, the village cadres also have special positions and powers in the daily administrative work of the village and in solving civil disputes.

Most village cadres come from relatively well-off families, as they have more experience. According to an investigation of 23 cadre families in eight villages of the four townships, including Jinlingsi township, Kanshansi township, and Yangxie township, just one family had a per capita income under 200 *yuan*. Only four families among the 23 had a per capita income lower than the average for local villagers.

5. Village Economy and Finance

The village economy mainly refers to village enterprises which are managed or contract-managed by village organisations. Besides village enterprises, some villages also manage a piece of farmland, orchard, mountain forest, and reed pond which have not been shared out to households. Also there are some villages that undertake collective sideline production.

According to an investigation in the villages of Baiyangdian township and the villages of Kanshansi township, the average annual income of villagers in 1988 was 3,500 *yuan*, the highest being 13,500 *yuan* and the lowest 350 *yuan*. The breakdown of income was as follows: 10.6 per cent from village enterprises, 12.8 per cent from contract village enterprises, 53.2 per cent from per capita contribution from villagers, and the remaining 23 per cent from other sources. Most, or even all, of the income of the villagers in remote areas comes from contributions from villagers.

According to an investigation in four villages of Yangxie township in a remote area, the average income per village was 3,700 *yuan* in 1988. Of this, 25.7 per cent was from the rent of the villages' fixed assets, two per cent from village enterprises' income, two per cent from renting fields managed by the villages, 4.1 per cent from the sale of collective property, and 65.1 per cent from contributions. The rent of fixed assets means the rent of former production brigades, but this is limited to villages with markets.

The average expenditure of the villages mentioned above in 1988 was 2,841 *yuan*. The expenditure was used as follows (i) 7.2 per cent for production investment, including 1.3 per cent for agriculture; (ii) 48.8 per cent for management fees, which included subsidies for cadres, teachers' salaries in the schools run by local people, allowances to the family members of martyrs and army-men, and administrative expenses; (iii) 31.8 per cent for public welfare expenses (including living expenses for childless and infirm old persons and expenses for recreational activities); and (iv) 12.2 per cent for other purposes. The production investment of the villages mentioned above also had a disaster relief component. In 1988, Shangzhou city had a flood which destroyed a lot of fields, river banks, and roads, so production investment was much more than usual. The expenses of village funds show that, organisations at village level do not have the ability to construct productive equipment on a larger scale. Moreover, it is difficult for them to keep the existing production equipment. The limited income of village organisations can just barely manage to support the weakened but still working administrative organs at the village level.

6. Conclusions

From the above study, the following conclusions can be made.

Before reform of the people's commune system, the village organisation - the former production brigade - had the function of organising agricultural production and distribution in the collective economic system and performed tasks entrusted by the government. After the reforms, the village organisation was transformed into an autonomous village committee. The function of organising production and distribution was handed over to the households. The function of providing productive and other services had not fully developed. As a result, farmers' organisations weakened.

Secondly, after rural reforms, although pluralistic power structures emerged in rural areas, no other force could compete with the quasi-official autonomous village committee, or production cooperatives. The latter is still the core of the rural power structure, and also the organisation which is relied upon by the Government to carry out State policies.

Thirdly, during the commune period there was an actual 'cadre class' in which the cadres were separated from routine production activities at village level; those cadres were especially responsible for carrying out government policies. In that system, the compensation for the cadres' loss in labour days was paid by the collective economy which supported the working of administrative institutions as an extension of the Government. Village cadres were chosen by the communes. This made village organisations more biased towards government interests. But the situation has now changed. Every village cadre engages in his/her household economy, and his household productive income constitutes his main income source. This makes village cadres' interests consistent with those of ordinary farmers. The system of providing compensation for cadres' lost labour days has been replaced by the cadres' fixed compensation system in which the subsidies for village cadres are few and not guaranteed. This has weakened the linkages of village cadres with the township government. Therefore, when government policies are in conflict with village farmers' interests, the cadres usually support the farmers. While this has provided autonomy to village organisations, it has also hindered the implementation of government policies at the village and household levels.

ANNEXES

Annex 1

PROGRAMME

Monday, 22 March: Arrival of the Participants and Registration

Session I: Tuesday, 23 March (9:00 - 12:00)
Meeting room: 3017 (Third Floor)
Inaugural Ceremony
Chairman: Mr. Yang Zhong

9:00 - 9:10 Welcome address on behalf of CAS, Prof. Li Zhensheng, Member and Former Vice-President, CAS

9:10 - 9:30 Address by State Councillor: Mr Chen Junsheng

9:30 - 9:45 Address by Ford Foundation Representative: Mr. Nick Menzies

9:45 - 10:00 Address by ICIMOD Representative: Dr. N. S. Jodha. Briefing on meeting programme by Coordinators

10:00 - 10:15 Coffee Break

10:15 - 10:45 Perspectives on Poverty Generating Processes in Mountain Areas
Dr. N. S. Jodha

10:45 - 11:15 Relative Poverty in the Villages of Hilly Areas of Nigata, Japan: The Depopulation and Decline of Agriculture
Dr. Tanaka Yosuke

11:15 - 11:45 Research on Classification and Development of Poor Areas in China
Prof. Jiang Dehua

Session II: Tuesday, 23 March (14:30 - 17:45)
Meeting Room: 3017 (Third Floor)
Chairman: Dr. N. S. Jodha

14:30 - 15:00 Economic Development in Poor Mountain Areas of China: On Policy Strategy
Proj. Ai Yunhang

15:00 - 15:30 Poverty in India: Micro-level Evidence of Relevance to Poverty Studies in China
Dr. Barbara Harriss

15:30 - 16:00 The Wangdonggou Watershed Development Model (WGWOM) on the Loess Plateau
Prof. Li Yushan

16:00 - 16:15 Break

16:15 - 16:35 Sustainable Development in Poor Mountain Areas: The Lessons Learned from the UNCED Earth Summit, Rio de Janerio, Agenda 21, Chapter 13
Prof. Jack D. Ives

16:35 - 16:55 Ecology, Rural Problems, and Sustainable Development in the Tropical Andes
Dr. Christoph Stadel

16:55 - 17:20 Poverty Alleviation through Watershed Management in Mountain Areas: The Case of the Xiaojiang Watershed, Yunnan Province
Prof. Li Tianchi

17:20 - 17:45 Social Security in China and India
Dr. Athar Hussain

18:00 - 20:00 Dinner given by Prof. Hu Qiheng, Vice-President, CAS

Session III: Wednesday, 24 March (8:30 - 12:00)
Meeting Room: 3017 (Third Floor)
Chairman: Prof. Li Zhensheng

8:30 - 9:00 Poverty and Anti-poverty Issues in the Context of Mountain Regions
Dr. Vineeta Hoon

9:00 - 9:30 Analysis of Industrial Economy in Dabieshan Mountain Area
Prof. Zhu Kahua

9:30 - 10:00 Children, Environment and Sustainable Mountain Development: A UNICEF Perspective
Dr. Deepak Bajracharaya

10:00 - 10:15 Coffee Break

10:15 - 10:45 Strategies for Alleviating Poverty - The South Asian Experience
Dr Anis Dani

10:45 - 11:15 Rural Development in Poor Districts in North China - The Mountain District of the Eastern Yan Mountains
Prof. Li Guiseng

11:15 - 11:45 A Dozen Reasons Why Farmers Do Not Adopt Innovations Intended to Improve the Sustainability of Mountain Agriculture
Prof. Sam Fujisaka

Session IV: Wednesday, 24 March (14:30 - 17:45)

Group I Chairman:
Meeting Room: 5015 (Fifth Floor)

i. Population, Poverty, and Development Issues in the Hindu Kush-Himalayas
Dr. Pitamber Sharma

ii. Some Economic Problems of Agricultural Resource Development in China's Poor Mountain Areas
Prof. Zheng Dahao

iii. From Poverty to Sustainable Development - A Case Study of Ningnan County, Sichuan China
Dr. Liu Yanhua

iv. Rural - Urban Linkages
Dr. Desmond McNeill

Group II Chairman:
Meeting Room: 5017 (Fifth Floor)

i. The Tendency of Poverty Alleviation in Chinese Poverty-Stricken Districts
Prof. Li Xiaofang

ii. Understanding Environment - Poverty Relationship in the Fragile Region: An Introductory Framework
Dr. J. Bandyopadhyay

iii. A Study of the Main Problems Limiting Development of Poor Mountain Areas - The Case of the Chaoyang District
Prof. Wang Benling

iv. The Need for a Special Economic Policy for the Development of the Poor Districts in China
Prof. Yan Ruizheng

Session V & VI Thursday, 25 March (8:30 - 17:30)
Group Discussion

Subject Areas for Group Discussion

1. What is Specific about Poverty in Mountain Areas?
(Biophysical and Socioeconomic Circumstances and Their Implications)

Chairman: Dr. N. S. Jodha, Mr Gao Hongbin
Meeting Room: 5015 (Fifth Floor)

- Ways of Understanding/Diagnosising Poverty and Its Process

- Intervention Strategies, Design, Implementation of Projects.

- The Missing Mountain Perspective

2. Environment - Development Conflicts in Mountain Areas
Chairman: Dr. Jack Ives, Mr. Ai Yunhang
Meeting Room: 5017 (Fifth Room)

- What are the core issues? How well de we understand poverty -- degradation linkages and profit extraction degradation problems?

- What experiences we have from current strategies to handle them?

- Assuming that the current strategies may need reorientation along the lines of a Mountain Perspective; What operational steps are suggested?

3. Market Driven Transformation Processes and the Mountains
Chairman: Dr Deepak Bajracharaya, Prof. Li Tianchi
Meeting Room: 5019 (Fifth Floor)

- In this context, how well do we understand the marginality of mountain areas/people with all its complexities?

  What are its manifestations/consequences to poverty alleviation from these areas?

- Is the market - unequal exchange leakages with mountains - a big problematic issue? What are the remedial approaches?

- What are the prospects of achieving sustainable development in mountain areas by properly harnessing their niche and diversity in all their dimensions? Will it not facilitate promotion of production processes which are unique and productive?

Note: The discussion may be illustrated with the experiences of China and other countries, while covering the topics listed under each subject area.

Excursion Day Friday, 26 March, 1993 (8:00 - 18:00)

Visit to the Great Wall
Imperial Palace
Tiananmen Square
Town and Country Trade Centre

Session VII Saturday, 27 March, 1993
Meeting Room: 3017 (Third Floor)
Chairman: Dr. N. Menzies

8:30 - 9:00	Presentation by the Rapporteur from Group One - Dr. N. S. Jodha
9:00 - 9:30	Presentation by the Rapporteur from Group Two - Dr. Jack Ives
9:30 - 10:00	Presentation by the Rapporteur from Group Three - Dr. Deepak Bajracharaya
10:00 - 10:30	Open to Individual Remarks
10:30 - 11:00	Closing Remarks by Prof. Li Zhensheng, Member and Former Vice-President, CAS

Annex 2

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Participating Countries of the Hindu Kush-Himalayan Region

- **Afghanistan**
- **Bangladesh**
- **Bhutan**
- **China**
- **India**
- **Myanmar**
- **Nepal**
- **Pakistan**

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