

Towards Sustainable Mountain Agriculture in the 21st Century

1. An Integrated Approach that Meets the Realities of Mountain Farmers and Herders

In this chapter, I wish to bring the arguments developed in the previous eight chapters to bear on guidelines for addressing sustainable mountain agriculture in the 21st Century. I will first summarise the recommendations I have outlined in the text of this book as well as suggest other immediate actions. I have nine specific recommendations to make.

- ***Create New Conceptual Analytical Frameworks for Mountain Research and Development***

In Chapter 2, I argued that the development and theoretical views on sustainable mountain agriculture have been primarily part and parcel of the general packages implemented in LDCs, whatever the kind of environment. These overly mechanistic approaches are based mainly on neo-classical economic interpretations of land degradation, although abundant data exist to show that this perspective only represents a part of the story. Other perspectives which have been advanced include historical cultural ecology and world systems' theory. All of these perspectives seem, in the post-industrial period, somewhat bankrupt and inadequate to explain global-local dynamics and the active roles/perceptions of local populations in shaping and reshaping the mountain landscape. A fresh theoretical perspective more attuned to mountains based on a revitalised montology is needed.

- ***Define Sustainability as a Process of Capacity Building for Problem Solving***

In Chapter 3, through a process of contextualising

sustainability, I argued that the concept's definition depends on particular 'points of view', especially institutional ones. Developing indicators of sustainability or unsustainability for sustainable mountain agriculture, for example, is only possible in *hard system* analysis where scientists assume a *closed farming system*. This approach, however, overlooks the 'openness' of vertical mountain exploitation where no single zone is capable of supporting a population for any length of time and where survival strategies require far-flung external connections (Banskota 1989). Therefore, linkages across zones and beyond the region are the norm rather than the exception. Scientific perspectives need to be complemented with a conception of sustainability as the capacity of a community to respond effectively to uncertain changes and challenges in the environment in order to maintain or augment the resource base and level of productivity. This perspective places sustainability on a human **processual** plane instead of on the level of external "indicators" as reflected in the biophysical or socioeconomic data of interest only to scientists.

- ***Scale Socio-Demographic and Biophysical Levels for Decision-Making***

In Chapter 4, I argued that, before sustainability can be operationalised or planned for, Mountain Researchers and Planners should scale both the socio-demographic and biophysical hierarchies of the HKH from the lowest levels to the highest (households to trans-national institutions; plot to ecoregion). Such a scaling exercise is necessary to set priorities, detect linkages, and to collect data that will have meaning within the ecoregion.

- ***Develop a Systematic Interactive Database (MASSIF)***

In Chapter 5, I argued that although appropriate systematic data on mountain farming systems presently exist (often in grey literature), it has not been collated and analysed in a systematic fashion. Associated with the scaling exercise, a project called MASSIF should be implemented by ICIMOD. This project, which calls for the collection of data independent of government census reports,

will aim at fleshing out the details of the mountain farming systems which prevail in the region. It will also directly address most of the objectives of Chapter 13, Agenda 21 (Managing Fragile Mountain Ecosystems). The information will reveal, in broad strokes but sufficient for planning, what major farming systems exist, how many people practise them, where they occur, what are the biophysical and economic correlates, what priority problems and constraints exist, and so on. Until this is advanced, development efforts will continue to flounder under Himalayan *uncertainty* wherein it is difficult to determine "the facts" (Thompson and Warbuston 1985). MASSIF should be placed on an interactive GIS format and made available throughout the region and world. A methodology is proposed to accomplish this in this book.

- ***Clarify the Linkages between Population-Poverty-Environment in Mountain Contexts***

In Chapter 6, I discussed the MASSIF interactive database and other research to help reveal both the patterns and complexity of the precise impact of farming on livelihoods and the environment in the region. There has been a presumed Neo-Malthusian link between population increase, poverty, and environmental degradation. I argue that neither *poverty* nor the *environment* have been defined with any precision in this scenario. Instead of simplistic thinking, I recommend an approach that disaggregates and operationalises the concept of environment as well as the assets of the household or community. The participating households (and the community) may be well off in some assets but deficit in others. This fact then becomes a tool for policy and planning for development. Both households and communities are perceived to have some resources but to be missing others, which may become the responsibility of planners, projects, and policy-makers.

- ***Stimulate Open and Continuing Dialogue between Stakeholder Groups***

In Chapter 7, integrated mountain development is cast against a background of the perceptions and the requirements of diverse stakeholders (farmers, researchers,

practitioners, policy-makers/planners, and donors). ICIMOD and other mountain development organisations need to play an analytical and conflict resolution role in addressing the diverse interests and needs of stakeholder groups. One central research question will revolve around the dynamics of individual farm households' abilities to implement sustainable agriculture or natural resource management practices in light of broader societal needs as framed by Agenda 21. I have argued here that both societal environmental goals and the ability of mountain farmers to respond to them are unrealistic, generally due to cost and time. Too much of the burden of solving societal problems is placed on the farmer. However, the mountain community has historically taken an active interest in encouraging its members to undertake long-term sustainable practices and should be actively integrated into the process through community-based participatory research and development. This will help lower costs by mobilising household resources for the common good, achieving economies of scale, and shortening the time required for adoption of sustainable technologies.

- ***Design User-friendly and Practical Participatory Approaches for Mobilising Mountain Communities for Sustainability***

Chapter 8 outlines a philosophy and methods of working with mountain farm communities. Some guidelines for a user-friendly participatory approach with mountain communities were presented. If the mountain community represents a potential solution to shortening the time of adoption, decreasing costs, and increasing both individual and community benefits, then it is incumbent on integrated development specialists to design and implement effective means of working with mountain communities on their terms. ICIMOD should play a pivotal role in developing participatory methods, protocols, and guidelines based on experiences throughout the HKH region and engage in an active training programme to disseminate the information and ideas.

- ***Build Research and Development Activities around Programme Areas Defined by Major Farming System Clusters***

Despite unique conditions, mountain development

faces many of the same set of problems confronting other kinds of agricultural research and development, regardless of environment. One issue centres on how government or formal research bodies, with an ecoregional or national mandate, address specific problems on the ground, but with limited resources. For instance, there are 120 million people in the HKH and thousands of community settings. So how does an international centre like ICI-MOD, with limited resources, or even the national programmes, with fewer resources, deal with this diversity? Not only is there tremendous variation brought about by the ecology, but advancing globalisation may be introducing even more specific and varied localised responses. At present, international centres operate mainly through linking with national programmes in the development and transfer of general methodologies or generalisable principles underlying technologies. Although specific technologies (e.g., best bet technologies) can be used as examples in this process, international centres should guard against trying to become the agricultural extension service to HKH (or Andean or East African) mountain farmers. This is neither feasible nor the mandate of an international centre. The same set of issues will be faced in the other mountain regions, such as the Andes or East Africa, where sustainable agricultural development is increasingly being undertaken by international centres. The gross agroecological characterisation and technology transfer of advanced breeding lines, typically used by the CGIAR, are also not applicable in the mountains due to the great complexity in mountainous areas (this is the same reason why mountain soils, temperature, and vegetation are difficult to map; often cartographers who try end up referring to ambiguous *mountain soils* or *mountain regeneration*). Nevertheless, action demands more than idiosyncratic data; we must be able to discern generalisable patterns or clustering of relevant phenomena. A middle path between total uniqueness and gross overgeneralisation must be explored both methodologically and conceptually.

I suggest that, despite mountain variability, one can determine major farming system clusters which have their

own internal logic, relationships between environment and production, population patterning and production systems, and market types. These farming systems can be defined from the MASSIF exercise outlined in Chapter 5. Furthermore, in an analogous sense, these systems will have parallels in other parts of the world and can open a dialogue between mountain development specialists working in the major mountain regions. While the particulars will vary, this mapping exercise presents a general comparative framework for interaction on methods, research, and perhaps even technologies between zonal and major farming systems. Although we have not yet benefitted from the MASSIF exercise, we might hypothesise that the five major Farming Systems' types outlined in Chapter 5 could form the basis of programmes (i.e., specialised pastoralism, mixed mountain agro-pastoralism, cereal-based hill farming, shifting cultivation, and specialised commercial systems).

Each of these "farming system programme areas" will require an interdisciplinary team which should be made up of biological scientists, socioeconomists (including gender specialists), natural resource management specialists, agricultural scientists, and planners/engineers. By having the farming system as a programmatic focus, they can zero in on problems and will have a central focus to their efforts. These farming systems, in turn, can be related to similar systems in other parts of the globe (Asia, Africa, Latin America, the Middle East, Europe, and the South Pacific). The logic of programmatic thinking is that the analysis and data allow clear priority setting, determination of numbers of people impacted, economic importance of the farming system in question, and potential for extrapolation of results, methodologies, and technologies between similar systems. An example of how this might work can be taken from the strategic plan of the International Rice Research Institute (IRRI) which also deals with diverse Asian rice environments. They classified the 'rice environments' based on careful mapping into systems: (1) irrigated rice ecosystem; (2) rainfed lowland rice ecosystem; (3) upland rice ecosystem; (4) deep water rice and tidal ecosystems; and (5) cross-ecosystem research (IRRI 1991). Based on a cost-benefit analysis, it was de-

cided that IRRI could have the greatest impact on the irrigated lowlands, but the other systems were allocated a certain investment based on other considerations. For example, upland rice received a larger share of research investment because of the marginality of the people living there and potential upland-lowland impacts caused by land degradation. Similar analysis of mountain systems and ranking of problems can be carried out on mountains once systematic data are available.

Another benefit of the comparative programmatic approach is in linking stakeholder groups through a common problem-area focus (the farming system) as well as giving concerned institutions a clear platform upon which to compare data and approaches and share experiences. This is not only true within the HKH region but between the HKH and other major mountain systems, especially the Andes and the Himalayas. In many areas (e.g., biodiversity improvement or participatory watershed management) there are innumerable projects, all with similar multipurpose goals, but which are not working together or coordinating results. This is clearly a key role for ICIMOD, and creative venues must be defined so that the exchange is meaningful. Beyond the HKH, similar sharing of experiences should take place with other mountain regions (ICIMOD's leadership in the Asian-Pacific Mountain Network is another example).

• ***Build Capacities in National Institutions to Deal with the Affects of Global Change on Mountains***

Our approach to sustainable mountain agriculture must deal honestly and practically with continuity and change within the framework of a globalised world order. The potentially positive and potentially negative aspects of economic liberalisation stimulated by the World Trade Organisation Treaty and GATT cannot be ignored. On the one hand, it opens the door for increased involvement of multi-national corporations, not to mention a free hand for more localised capitalistic ventures in the HKH. How will mountain farmers face this external challenge? Is the Swiss experience relevant? Will larger development forces ultimately bring prosperity or at least an acceptable quality of life? Will the "Asian Tigers" of

super growth be able to uplift the HKH in their forward progress?

The other side of the liberalisation movement is that, increasingly, local communities, even in formerly centrally governed countries like China, are given more and more freedom to manage their local affairs. Throughout Asia, from the Philippines to Pakistan and from China to Sri Lanka, local community governance over their territories (hence the farming system) is becoming a reality. Decentralisation and democratisation are twin and widespread forces. This could signify that the community mechanisms for sustainable development (Chapter 7) I have argued for in this paper could become more of a reality. However, appropriate participatory methods must be refined and utilised by dedicated mountain researchers before the community potential can be realised. Issues of rights of local communities (e.g., over biodiversity or water) will be extremely important in policy matters, but whether advances come by external policy forces or internal strategies, change at ever faster rates is one constant of the new mountain order.

The human globalisation impacts on mountain communities are accompanied, although their correlations are not clear, by global climate change impact, a phenomenon which is still poorly understood. To date, the main issues of debate related to Himalayan environmental degradation have been about social problems such as overpopulation, deforestation, and soil erosion (Chalise 1994). Gradually, however, evidence is beginning to mount that 'global warming' and 'climate change' will add to the social problems, perhaps in dramatic ways. Although much of the information is anecdotal, it appears that the retreat of glaciers, decline in water supplies, failure of crops and fruit trees, and disappearance of wildlife are related to global warming. According to old-timers in the Nepali village of Manang, which faces Gangapurna (7,454m), the mountain's glacier has retreated more than 150 metres in a lifetime. They note the decrease in the volume of water in the stream which is used to irrigate village fields. Despite outmigration and increasingly fallow fields, the water is not enough. Although the villagers never heard of global warming, they realise something is wrong. They

envision a time when snows will disappear and their villages will become deserts (Gurung 1996).

Unfortunately, these observations are not misplaced musings of ignorant villagers. Chalise (1994) has documented, as well as possible at this point, the scientific evidence of global warming and its impact on natural and human life. ICIMOD scientists returning to the field are noting that crops and fruit trees are being planted at higher elevations since they are no longer adapted to lower zones (H. Sharma, personal communication). My own research in the Ecuadorian Andes has revealed a major concern among highland indigenous populations about their water supply. This concern has reached the point at which shamans are being called to appease the gods who must be angry. If global warming is real, and at this point science is unsure, loss of water for highland communities alone could signal their complete demise. Is this impact being felt at the highest altitudes throughout the globe? If so, the change must be understood and planned for as it will affect both human and natural communities. ICIMOD has a clear role and mandate for this important work.

In summary, the sustainable mountain development paradigm presented here calls for new theoretical "blending" and reshaping of interpretations, scaling of hierarchical systems, a systematic data base called MASSIF, understanding of population-environmental linkages, a stakeholder analysis, and a community-based participatory approach. In addition, programmes need to be developed around farming systems' types and a capacity to deal with global change in national programmes developed. It is my belief that this integrated mountain development paradigm outlined here is also applicable to the HKH as well as the Andes and East Africa. At a minimum, this framework can offer venues through which institutions in the scattered mountain ecoregions can open a systematic dialogue on programmes.

• ***Call for an International Workshop on Sustainable Mountain Agriculture: Rio plus Ten***

Although I have made some rather caustic comments in this book about *experts* and 'expert meetings', the time is growing ripe for a gathering of mountain scientists,

development practitioners, and indigenous highland representatives to debate future strategies of mountain agricultural development. The time is not appropriate to revisit themes only but to critically and honestly confront the new issues facing mountain research and development. To be productive, this workshop should include as many stakeholders as possible. The spirit should be to create venues that allow everyone a voice: mountain people, scholars from many disciplines, planners, developers, private foundations, and international research agencies. In particular, the voices of mountain farmers themselves need to be heard and incorporated into mountain planning.

The new themes to be covered in such a gathering include the following.

- The Future Role of Mountain Agriculture in a Globalising World: Local Global (Dis)articulations
- Methodologies for Reducing Uncertainty in Data and Priority Setting for Sustainable Mountain Agriculture
- Rights and Roles of Mountain Farmers: Policy, Planning, and Participation
- Strategies for Negotiating the *Mountain Commons*: Land, Water, and Biodiversity
- Global Climate Change and Mountain Farming: Present and Future Implications
- Participatory Watershed Management for Sustainable Agriculture: Lessons Learned
- The Creation of the Science of **MONTOLOGY**

2. Rethinking Mountain Perspectives: Creation of an Interdisciplinary Montology

Many seasoned mountain observers are quick to point out that developments over the past half century have brought about a pace and depth of social change unparalleled in the history of human settlement in the

* Montology - from the root words:
mons - montis (L) - mountain
logus - us-i (L) - word
or logy - the root of 'to speak' (GK). Literally - "to speak of the mountains, mountain knowledge, science (cf geology, psychology, petrology, biology)

mountains. This *historic transformation* is characterised by a global, external intrusion into formerly isolated regions which are simultaneously experiencing internal changes such as population increases and sociocultural transformation. Although I have argued in this book that mountain communities have, to varying degrees, always undergone change from external and internal forces, I accept that the magnitude and velocity of the change today is unparalleled in history. The implication, I believe, is that these new mountain circumstances call for creative thinking, new models, and a renewed dedication to mountain research. In short, the old schools of thought (neo-classical Malthusian economics, historical cultural ecology, and world system theories) have made their contributions but have run their courses. More systemic thinking is called for in the modern period.

Since the 17th Century, western science has seen nature largely through mechanistic lenses. In this vision, mountains were mere backdrops to the human drama unfolding, remaining at rest or moving unilineally unless acted upon by some outside force. Change was seen as externally derived, as in the operation of a machine. As so vividly shown in *The Turning Point*, the world was seen as a clock, adjustable by human clockmakers; nature itself as passive and manipulable (Capra 1982). Ecology challenged this idea by focussing on the interchange of energy, materials, and information among living and non-living organisms in the natural environment (Odum 1977). Nature is a whole of which humans are only a part, albeit that, with increasing technological advancement, they become a more and more significant factor in the landscape. Even then, trajectories of change are not straightforward pathways. As humans attempted to survive in the mountains, they made agricultural decisions which set in motion unforeseen changes. The adoption of the potato, for example, set some agroecosystems along new lines which in turn carved out new impacts on the landscape. Again, human populations adapted/adjusted to these new conditions, further making decisions that were to alter future courses. Certainly, patterns of change are clear, but there never was some past, present, or future equilibrium (or homeostasis).

The point I am driving home here is that mountain peoples have continuously changed their relationship to the mountain environment. These changes arise from tensions between production and ecology, and between production and reproduction. The outcomes are new constructions of the mountain landscape, both in terms of material and cultural dimensions (Merchant 1993). Mountain scholars, planners, and activists need to appreciate this dynamic which is, ironically, *ordered chaos*, planned and unplanned change, and continuously shifting human definitions of the mountain milieu. Mountain studies must bring to the table new critical thinking and the interdisciplinary breadth as well as analytical expertise to deal with non-mechanistic interpretations of mountain change. A revitalised *montology* may well build on the three major perspectives of the past (neoclassical economics, cultural ecology, and world systems' theory), but it must also take the next step of incorporating a perspective which accounts for humans as pivoting creators and destroyers in the mountain lands.

Mountain peoples and those who help plan their futures are facing a global transition, and we are unable to see clearly what lies down the road. However, we need a map and some vision of the barriers along the way if we are going to succeed. The global economy is reaching into the most remote mountain valleys, and the final transition to modern society is near for many mountain peoples. Whether the transition will lead to more poverty and degradation, revitalisation and stability, or something in between is the subject of much debate.

Unfortunately, there has been evolving in recent years a growing post-modern suspicion concerning the ability of our science to ask the right questions, much less provide the right answers. This is due in part to the tremendous variety of local responses to articulation with a growing global system which does not give much credence to the simple theorising of cultural enclaves, and general claims against male-dominated power structures have further eroded simplistic social theory and explanation. One result of this has been a retreat by mountain scholars from comparison, extrapolation, and the construction of gendered models to guide our thinking. One outcome of

this more particularistic focus has been the infamous and often quoted problem in this book of "uncertainty on a Himalayan scale", wherein everyone is right and everyone is wrong. I agree here, however, that it is time to pursue with great vigour and enthusiasm a science of the mountains that will provide a framework for global discussion about the *sustainability issue*. The new science must be capable of walking the tightrope between the particular and the general, the local and the global, the past and the future. We need to identify patterns, however messy the clustering, so as to be able to speak to each other across geographical boundaries and to plan sanely for sustainable development. *Montology*, by its very nature, will be part humanities, part social science, part natural science, part policy science, and part folk science (Hewitt 1988). It will be interdisciplinary, intercontinental, and intersectoral. It should be university and field-based. Above all, it must be relevant to mountain people.

3. Sustainable Mountain Agricultural Development: Some Conclusions

In this book, I have addressed several mountain agricultural sustainability issues which have arisen since the first major conference on the subject was held in 1990 (Jodha, Banskota, and Partap 1992). At that time, sustainability was a relatively new concept on the development scene, and I was unsure how it related to, for example, concepts of *integrated mountain development*. Today, some six years later, we have a much clearer picture. Sustainability is a normative concept based on the values and perceptions of the user of the term, but a powerful one which redefines agricultural development itself. Mountain researchers and practitioners have responded to the many challenges surrounding this concept and have made substantial contributions.

As scholars, planners, and development practitioners concerned with mountain development, we cannot escape from the dilemma posed by Thompson and Warburton (1985) in their article "Uncertainty on a Himalayan Scale." Given such wide discrepancies and messiness in data (a true reflection of the HKH variability), how does one de-

cide to hit the *moving target* of *sustainable development*? The dilemmas are many. For example, integration between what? There are so many conflicting aspects: diversity versus specialisation; subsistence versus commercialisation; internal versus external knowledge and inputs; long-term versus short-term; stable but low yields versus high costs, unstable productivity; production for local needs versus distant markets.

Thompson and Warburton (1985) would argue that these only have answers in relation to one's personal and institutional values, and that institutional perceptions for the moment are the only true facts worthy of study. Where the institutional neo-Malthusian classical economist sees "past systems falling apart" which need to be replaced quickly by modern technologies and institutions, the cultural ecologist (normally university-based) sees persistence of viable traditions that remain more sustainable than lifestyles driven by short-run economics. Who, then, is right? I have argued in this book that, to some degree, all are right and all are wrong. The real need, moreover, is to move beyond the old theories towards the testing of new ones. The Himalayas are, today, a fluid geomorphological structure which daily continues to change shape and form, leading to shifting complexity and diversity. The human landscape is even more varied and dynamic. What becomes clear, whether we are talking about landscape or ethnoscape, is that one cannot generalise about the whole region based on a case here and a case there and the changes and relationships are certainly not mechanistic. Any facile generalisation is bound to be contradicted somewhere; generalisations based on systematic comparison of many cases will be harder to dismiss. Yet data itself will only have meaning within theoretical frameworks, and it is in the creation of a new critical science of the HKH that meaning will be found and practically applied.

One of the more dangerous generalisations floating about today is that of the determinist who rationalises that "it's ultimately going to change anyway", as if this were an excuse for more, unreflected mountain development. Change, sometimes slow and sometimes dramatic, has been going on ever since the first hominid (pre-hu-

man) roamed these mountains. There has never been some stable, static past which was only recently interrupted by economic change in the post WWII period. Mountain peoples on their own have evolved strategies (see Chapter 7 in this book) for coping with mountain environments, especially verticality. Any positive change introduced from the outside will not completely replace prior patterns, but will be integrated into them. Dichotomous concepts, such as upland-lowland, traditional-modern, scientific-indigenous, and subsistence-commercial, are likely to be of more interest to outside researchers than mountain farmers who are by nature "systems' thinkers." My own research among potato farmers in the Andes and Himalayas demonstrates the systematic manner in which new varieties are experimented with, introduced into the cropping systems, and ultimately make their way into the farmers' 'traditional' farming system. The farmer does not think in modern versus traditional terms but looks upon potatoes as potatoes, some of which he has had much longer than others. We need conceptual models and empirical research to help us walk this tightrope between the past and the future, between traditional and modern, between local and global, and between people's aspirations and society's needs.

To be sure we cannot turn our backs on the forces of contemporary change. The relationship between these aspects of HKH social change and their correlates (outmigration, urbanisation, industrialisation, and market and government penetration into rural areas) with agricultural change is not fully understood, but we know enough to document the clear impacts. (An excellent survey of population dynamics and employment is provided by Sharma [1993].) In the absence of systematic data, my own inclination is to not yet pronounce the entire HKH agricultural scene a backward system needing 'transformation' through external technology infusion. Questions concerning why some areas 'transform' and others do not, what are the relative degrees of degradation in different farming systems, and what empirically (as opposed to "guessing") is happening to subsistence agriculture will be answered through a compilation of systematic databases focussed on farming. Action need not wait forever, but

unless the first steps are taken in the development of the systematic database (MASSIF), we will forever miss widely the moving targets of sustainable development.

The mountain perspective framework developed by ICIMOD and other mountain scholars before has, as pointed out in Chapter 2, helped to alter significantly the way mountains are viewed by policy-makers and national programmes. The point I wish to drive home is that now the concept of mountain perspective must be integrated with an empirical database (MASSIF) which lifts us beyond mere sloganeering. Only then will the mountain perspective framework become operationally useful for actual policy and programme implementation. When the systematic database is operationalised, comparable assessments of *transformed* versus *non-transformed areas* (beyond anecdotal or singular case extrapolation) will allow us to realistically trace the trajectories of different areas for design of effective policies and technologies.

Undoubtedly, a great deal of progress has been made in the short seven years since ICIMOD sponsored its first international symposium on sustainable mountain agriculture (Jodha et al. 1992). There is a widespread societal awareness of the global importance of mountains, the *mountain perspective* has been assimilated by policy-makers and planners, and a global mountain initiative has been launched. In many ways, these are dreams come true for many of us who have followed the fate of the mountains. But these are the easy slope pathways towards sustainability. Now the steep climb begins. We have to bear down, systematically uncover the hard data, prioritise our efforts, gain support from the responsible national bodies, and gain the confidence of mountain folk. Then we will have reached the summit where we can pause and reflect on the winding path below.