The Current State of Agricultural Education and Research in Mountain Areas

Agricultural Education

a. Agricultural Education Institutions

The main problems for educational institutions located in the HKH region have been extensively reviewed in the country reports published by ICIMOD in 1995 (Khosla 1995; Partap 1993; ICIMOD and RGOB 1994; CAS 1994). All these institutions, especially the universities, have different organisational structures, curricula, linkages with other components of the agricultural sector, and outreach programmes. Besides the general problem of shortage of funds and trained manpower, most of these institutions suffer from the following problems.

i. Since the institutions have been organised on the pattern of the relatively more successful and older plains' institutions, their organisational structures and curricula emphasise crop production under irrigated conditions. This, of course, is entirely unsuitable for mountain ecological and socioeconomic conditions.
ii. Agriculture in mountainous areas is largely based on integrated crop-livestock-

agroforestry farming systems, whereas the educational system is implicitly based on monoculture of individual commodities, mostly food and cash crops. Horticulture and pasture management, which are very important in mountain areas, are not sufficiently covered in the curricula.

iii. The fragility of the environment in mountainous areas means that sustainable use of the resource base is vital for the growth of agriculture in these areas. Adequate emphasis has not been given to this in the curricula.

iv. The linkages of these institutions with research institutes, extension organisation, and the public sector development system are often quite weak. Educational institutions often confine themselves to on-campus teaching and thesis-oriented academic research.

v. In most cases, there is very little interaction of the teaching institutions with the farmer, and this has serious adverse consequences for the quality, relevance, and usefulness of the knowledge imparted for agricultural development in the region.

Although it is difficult to generalise about the situation of all the agricultural universities/colleges in the HKH region, these institutions have common organisational and operational problems. As a result of these, their graduates in agriculture are considered to be deficient by the main employer-the state agricultural department, in terms of meeting the challenges of sustainable development of the agricultural sector. Some of the problems are listed below.

- The curricula are copied almost entirely from the older Universities of Agriculture, and they are designed mainly for irrigated agriculture in the plains. No concerted efforts have been made to orient these curricula towards the specific needs of mountainous regions.
- Very little emphasis is given in the curricula to livestock, forestry, and range management, and these are important activities in the prevalent mountain farming systems. Most farmers operate integrated crop-livestock farming systems, including horticulture, but the curricula lack training in farming systems' aspects, especially in socioeconomic aspects.
- Colleges have no expertise in agriculture at the senior management level.
- Agricultural education does not receive the priority it deserves in terms of allocation of resources.
- These agricultural colleges and universities generally have no formal linkages with the Stateagricultural departments which have the responsibility for agricultural development (including research and extension). As a result, these institutions have no contact with the agricultural community and are not involved in identifying the problems of the agricultural sector or finding their solutions through research.
- Many of these educational institutions do not maintain their own outreach programmes - the farmers rarely visit the institutions and the faculty and students do not undertake research on farmers' problems.
- Very little funds are provided to the agricultural colleges and universities for research and outreach. As a result, both these activities are virtually non-existent in the many institutions.

From the country perspective, one finds that the priority given to agricultural education has not been uniform. It has received very high priority in China, although the emphasis within agriculture has changed quite drastically in different periods (CAS 1994). In addition, agricultural education in China has focussed principally on promoting technical and scientific skills through regular universities, colleges, vocational agencies, and adult education systems that use television and radio services extensively. Over the years, China has been relatively successful in producing a wide range of technical experts to support the development of science and technology-led agriculture.

However, in spite of this national emphasis on agriculture and the reasonable success that has been achieved, this success has been mainly in the plains. In most mountain areas, peasant families are still predominantly illiterate (Ruizhen and Yuan 1992, p257). Education in China's poor mountain areas is limited to primary education. The development in adult and vocational education seen in other areas has not yet reached mountain areas. Commenting on the difficulties of expanding education in rural mountain rural mountain areas. Ruizhn and Yuan point out, *".. the most difficult tasks is in mountain areas, where villagers live so far apart from each other that it is not uncommon for students to travel seven or even dozen kilometres to school on a daily basis, where the dropout rate runs high as parents want their children to stay home to help increase family income"* (Riuzhan and Yuan 1992, p259). Other common problems relate to the lack of qualified teachers, poor equipment, and shortage of funds.

Regarding other countries of the Hindu Kush-Himalayas, in those lying south of the Himalayas, agricultural education presents an anomalous situation, with problems appearing to be far more severe in the mountain areas. First, despite the fact that these are mainly agricultural economies with a fair share of the population still dependent on agriculture, agricultural education has not received the priority it deserves. Second, most agricultural teaching agencies are relatively new, having started only within the past five decades, and are still learning ways to integrate teaching, research, and extension. Third, in spite of the increasing number of agricultural teaching institutions and diversification of subjects, agricultural education is not a preferred subject if other alternatives are available. Rarely does one find a farmer who willingly supports higher education in agriculture for his son. Fourth, there is also a strong preference for supporting urban-based agriculture rather than working in rural and mountain areas. These are general comments applicable to agricultural education (Bernardo 1985). The situation in mountain areas is even worse.

Chart 1 illustrates some of the points noted above about the North West Frontier Province (NWFP) Agricultural University in Pakistan. Clearly, there is need for a much stronger mountain orientation in the curriculum and research work of the university. The important point is that these gaps are being realised, and, hopefully, some change in direction towards mountain areas may be seen in the future.

In Himachal Pradesh (India), the Y.S. Parmar University of Forestry and Horticulture is the only one of its kind that focusses significantly on mountain agriculture and related areas. There are a few other general-purpose universities in the other

Chart 1: NWFP Agricultural University, Peshawar

This Agricultural University was created in February 1981. The current enrollment of the University is about 700 students with an annual intake of about 120. The NWFP Agricultural University holds the key to making the agricultural system in NWFP effective. All the leadership positions in the system are manned by graduates from this University. The system is weak largely because agricultural education has been weak. If agricultural education is improved and agricultural research is merged with it, the combination will improve agricultural production and the living conditions for farmers. The main points for increasing the mountain focus are given below.

- Though rural women contribute greatly to agricultural production, their role has neither been recognised nor has any attempt been made to increase their efficiency and improve their lot.
- The Research Programme and the university's research institutes/stations lack an agroecological zone perspective. Commodity improvement and discipline-oriented research need to be balanced with increased research on natural resources' management and a new spirit of partnership has to be adopted, particularly to achieve sustainable improvement in mountain ecosystems.
- Different agro-ecological zones in the uplands and mountains should be clearly delineated, and this will facilitate the identification of potential production zones based on agroclimatic and soil characteristics.
- The NWFP Agricultural University is in an ideal position to play a leading role in directing R&D efforts for sustainable development of mountain agriculture.

Extracted from Dr. Zafar Altaf, Dr. Noor Mohammed, Dr. A.A. Hashmi and Zafar Uddin, "Strengthening Institutions for Agricultural Development in the Northern Mountains of Pakistan", ICIMOD, Kathmandu. 1993.pp. 43-50.

Himalayan states of India. While there is some research focussed on mountain areas, the extent to which the overall curriculum addresses the needs of mountain areas is not very apparent. This is probably less of an issue for the universities and more for general policy-makers, as the gap between available jobs and the number of university graduates in all the major subject areas is increasing rapidly. In mountain areas, where opportunities for economic expansion are even more limited, it is difficult to argue that mountain universities should focus on mountain relevant subjects only, as the opportunities to absorb their skills may be very limited.

As a result of the above institutional shortcomings, and especially as a result of their isolation from practical farming, the faculty and students feel quite demoralised since their academic and research activities are not entirely relevant to local conditions, and they do not have the confidence of the farming community. This unsatisfactory situation needs to be rectified urgently, drastically revising curricula to bring them in line with the prevalent farming systems and entrusting responsibility for research and outreach to them. Above all, the agricultural educational institutions must develop close two-way linkages with the farmers and devote maximum efforts to improving the net incomes of farmers and conserving natural resources.

Agricultural Research[1]

Almost all the HKH countries have agricultural research institutes/stations located in mountainous areas to solve the emerging problems and develop improved production technologies. There isconsiderably diversity in the organisational patterns of these institutions in various countries, but they do have some common characteristics. Most of the research institutions devote much of their efforts to field crops, especially cereals-- wheat, maize, rice, and, in some cases, potatoes. The research is limited mainly to evolving higher yielding varieties and to pest management problems. Research on livestock management, fodder production, pasture management, horticultural crops, and agro-forestry, especially as components of integrated farming systems based on several commodities, is often not included in the research agenda of these institutions. Most of the research efforts are limited to biological and agronomic aspects, while research on farm machinery, sustainable use of the resource base, soil conservation, and socioeconomic aspects is almost entirely neglected.

One of the main problems in the mountain areas is lapses in **post-harvest processing and marketing** of the produce. As a result of this, the net income of the farmers is quite low even if the yield is high as a result of using improved production technology. Most research institutions in the region neglect the crucial processing, storage, and marketing aspects almost entirely. This results in sizable losses of perishable produce and a great variation in commodity prices.

Women play an important role in the household economy of mountainous areas, especially in livestock management, small farmer poultry production, harvest and post-harvest management of most field crops, production and processing of horticultural crops, and several other aspects of agricultural production and marketing. In spite of this, very little attention is given to training women in different aspects of agriculture and to research on gender-specific problems.

Different countries have followed different approaches in developing their agricultural research systems. Bhutan is currently reorganising its agricultural R&D institutions under what is now called the RNR (Renewable Natural Resources) Strategy (ICIMOD and RGOB 1994). Under this system, R&D institutions have been categorised into six groups to fit into the prevalent production systems, viz., dryland plantation and orchards, wetlands, livestock, forests, and *Tsheri* land. This type of categorisation indicates a mixture of the commodity approach and the production systems' approach. Another important feature of the RNR strategy is the creation of an institutional mechanism at district level for implementing R&D programmes and providing feedback for planning and identifying/revising priorities. A mechanism has been provided in the institutional structure and mandate for a participatory approach and a role for farmers in deciding priorities. The present system has been

[1] Based Upon Partap, T, "Institutions dealing with Agricultural Research and Development: How they look and How they Perform" in the International Workshop on Institutional Strengthening for Sustainable Mountain Development

a response to the drawbacks and inadequacies perceived in the earlier system. It is, however, in the early stages of operation.

In China (Ningnan county), agricultural extension work is effectively managed at the county level and is a unique example of a decentralised system in the HKH Region (CAS 1994). The County Management Committee selects the research priorities and invites national and provincial research institutions to work on research projects in which the county is interested. Scientific teams have to prove the value of their recommendations on farm before the contractual obligations of the county are fulfilled. In China, programmes and funding can also flow from national and provincial development institutions. When the county engages national and provincial research institutes to carry out research work on a programme basis, it avoids the necessity of creating its own infrastructure. Farmers contribute financially to county management and also to particular research programmes. The R&D system is designed to reflect the priorities of the farmer in its agenda. In keeping with the above R&D orientation, provincial and national governments create research stations to address research aspects of regional interest. The Chinese system of R&D seen in Ningnan county is a model of a bottom-up R&D approach which is very sensitive to local circumstances.

The R&D system used by Himachal Pradesh in India is commendable for its performance in terms of facilitating the commercialisation of hill agriculture (through horticulture) (Singh et al.1995). The system is conventional in its structure and mandate. For instance, it is very centralised and follows atop-down approach with little leeway for using people's knowledge. The strong point in favour of the R&D system is that it has received political patronage from the State, ensuring adequate funding for manpower, infrastructure, and research activities. Moreover, different farming communities working as pressure groups (representing different interests) have played important roles (through political channels) and influenced the choice of research programmes.

Himachal has also experimented in combining education, research, training, and extension activities under the university system and technology transfers under development departments. These have demonstrated the ability to facilitate improvements in farming in Himachal Pradesh.

It has been recognised that the R&D system in Himachal Pradesh needs to develop capabilities to meet the new challenges of environmentally-sound agricultural systems.

The structures of agricultural and forestry research and development institutions in the mountain areas of Pakistan are well developed for the plains, but not for the mountains. Since only part of the area is mountainous, most R&D systems reflect a plains' orientation. However, one can find regional research stations established in specific mountain areas, and they work under the CAREPLAN (Coordinated Agricultural Research Planning System). Provincial development departments act as organs both for Technology Generation (TG) and Transfer of Technology (TOT) (Altaf et al. 1993).

Institutionalised R&D in Nepal is still in the evolutionary stage. Structurally, it has been designed to meet the great diversity of mountain areas, but its problems lie in meagre resource allocation, lack of manpower and infrastructure, and the lack of clear cut priorities for the agricultural development needs of the country's different regions (Acharya et al. 1995).

Good examples of successful R&D institutional systems in Nepal are represented by the Lumle and Pakhribas regional agricultural research centres. These two institutions work on the basis of a fully internalised participatory approach, effective on-farm demonstrations, and designing research programmes based on the needs and resources of regional farming systems. However, questions have been raised about the heavy budgets of these centres compared to other R&D institutions in Nepal.

Research and development in Bangladesh and Myanmar are based on conventional structures and mandates. Problems facing these areas indicate that efforts are needed to strengthen their mandates and structures to meet new challenges. Resource constraints and manpower limitations are critical factors curtailing their growth and achievements.

There is a noticeable lack of effective linkages between the different organs of research systems and the farmer. There is a visible absence of both mechanisms and mandates for a participatory approach. This makes farmers passive partners, receiving ideas and technologies imposed from outside.

An overview of agricultural R&D in the HKH countries reveals that some areas are encouraged, whereas in others further development is needed. Also, most of these systems are either extensions of plains' based research institutions or are controlled and influenced by them. Thus, the question arises as to how far these R&D systems are responsive to the conditions of mountain habitats and to mountain agriculture.

The practical realities of hill and mountain areas impose certain imperatives in the form of potentials and limitations, which, in turn, demand a specific orientation and structure of R&D institutions to suit mountain areas.

An understanding of mountain specificities makes one realise that R&D institutions for mountain agricultural development need to have broader and more diversified mandates, strong intersectoral and interdisciplinary linkages, and mechanisms for multidisciplinary teams of scientists to work on the problems, with regular feedback from the farmer. The outcome of research has to be relevant to the local farming community. Some salient features of the R&D impact assessment in Himachal Pradesh are quite instructive, with regard to the opportunities as well as to the gaps, as shown in Chart 2.

Almost all countries have an R&D focus on commodities' research. In some areas, such as Ningnan and Himachal Pradesh, agricultural research has visibly succeeded in making significant impacts. One key factor behind their success is their ability to

Chart 2
Salient Features of Impact Assessment of the Existing R&D Institutional System in Himachal Pradesh (India)

Mountain agriculture has been affected positively as well as negatively with the inception of R&D activities. The positive impacts have been changes in cropping patterns in favour of HYV cash crops, i.e., from subsistence agriculture to market-oriented production. The negative effect is reflected in the widening intra-regional disparities due to the comparative advantage of high-value cash crops

A technological breakthrough has a special relevance for hilly areas which are in the embryonic stage of development. There has been a breakthrough in fruit production. Farmers are no longer reluctant to accept new ideas and technologies.

R&D initiatives have resulted in need-based manpower generation. Trained, skilled, and qualified manpower is now emerging from the hill farm universities for development programmes. Need-based and location-specific farm education have also infused confidence among State Monitoring Services (SMSs) for effective feedback and sound interactions with scientists. The quality of manpower produced in hill farm varsities can further be improved by incorporating hill ecology components in the curricula.

Biodiversity plays a crucial role in maintaining the uniqueness of a mountain environment and the survival of mountain societies. Mountain people have now lost their links with mountain bioecology. The traditional gene pool is declining. Ethnobotany is on the brink of extinction.

The survey showed that, although people have become aware of modern inputs, the main problem confronted is the untimely and inadequate supply of inputs. Most farmers are still ignorant of the use of improved inputs.

Some of the local people's perceptions of R&D work, highlighted in the survey, are: provision of irrigation facilities, reducing the cost of fertilizers, timely provision of vital inputs, facilitating agricultural loans on easy terms, seed and fertilizer distributing centres, arrangement of more *kisan mela* (farmers' fairs), training and workshops, broadcasting of farming messages on radio and television, training of villagers for extension services, use of the local language for extension, and providing continuity in extension services.

Information on new technological inputs seldom reaches women because of the gender bias in extension services. There is a need for women Village Level Workers (VLWs). Women cultivators also reported having problems with credit. The need for NGOs' help in demanding equal wages was expressed.

Some of the women's perceptions regarding R&D, highlighted in the survey, are: identification of suitable and viable schemes, training women in non-traditional skills, free and accessible loans to different women's organisations, and the identification of women contact farmers.

Khosla, P.K., "Review of Agricultural Research and Development Systems in the Indian Himalayas. A Case Study of Himachal Pradesh," In ICIMOD, *Review of Institutional Capacities for Sustainable Mountain Agricultural Development*, ICIMOD, Kathmandu, 1995, p.88.

match their activities with the niche and agroclimatic conditions of the mountains. In other countries, such as Nepal, the focus so far has been on cereal crops (maize, wheat, rice), and this has only benefitted a few better-off farming communities with relatively fertile lands. There has been no impact on othercrops/products. The experiences of all countries indicate that there is a strong need for an alternative approach to R&D, especially one that integrates the past commodity focus with natural resources.

Motivated, well-educated, and properly-trained manpower is an equally important prerequisite to R&D institutions making impressive achievements. Concerns have been voiced in India and Pakistan about inbred and poorly-motivated scientific manpower. Solutions, such as reorienting educational materials by incorporating the mountain perspective, linking educational institutions to western universities, and maintaining contact with and ensuring exposure to external scientific work, have been suggested by some reports. This is a positive sign.

A few things become clear at this stage. First, educational facilities for developing human resources, which are especially designed for mountain agriculture, do not exist at present. Second, the existing professional manpower has been working in compartmentalised systems with little interdisciplinary interaction, and this probably favoured the commodity approach. Emphasis on the development of environmentally-friendly agricultural systems calls for manpower with broader training and good interdisciplinary knowledge. Should it be necessary to broaden the R&D mandates in order for mountain agriculture to accommodate resource management concerns, it will call for reorientation or retraining of most of the scientific manpower.

The traditional art and science of resource management and production were evolved and inherited by rural communities through centuries of informal experimentation. One finds that, despite their greater suitability and relevance, modern R&D institutions working for the development of mountain agriculture have given very low priority to institutional mechanisms that can retrieve rural people's knowledge (RPK) from the farmers. Although this neglect is part of the modern R&D culture worldwide, the intensity of the disregard for RPK in mountain areas is perhaps greater than elsewhere. Whatever the factors behind the neglect, the rationale, if not the form, of traditional technologies is very relevant today for they could constitute the most useful input into R&D in mountain agriculture. The institutional dimension of this blending of RPK with modern R&D, however, poses several questions involving collaboration of R&D scientists and farmers in interdisciplinary problem-focussed, location-specific work.

Yet another equally important issue is how much resource allocation is necessary to make institutions effective in development and delivery-relevant technologies? Existing experiences show that institutions, such as Lumle and Pakhribas, that are operating on very high budgets (by Nepalese standards), are very effective in performance and impact. The budgets of these two foreign-supported institutions, in com-

parison to locally-supported R&D systems, are very high, and the government R&D institutions are working on very low budgets. Reports from most other countries speak of poor resource allocation, particularly to research programmes and extension activities. In India, Himachal Pradesh reports higher resource allocations and better manpower facilities than the Uttar Pradesh Hills (3.5:1), and it is argued that it achieves better performance in and impact on agricultural development because of better resource allocation.

It is true that many of our R&D institutions are under-funded, but how much more is needed in terms of funds? What should the optimum scale of investment be? Can countries afford the Lumle/Pakhribas type of model?

An equally important question for national R&D planners and donors is that, in view of the diversity, location-specificity, high cost of logistics, etc should there not be different norms and yardsticks for research resource allocations in mountain areas? Questions that R&D scientists should look into are how much extra will it cost to reorient their work to involve the farmers' perspective, introduce diversification, and integrate resource-regenerative components in their technology? What do they think of low-cost technologies? How far can they follow the Ningnan (China) model in which agricultural R&D is a local, community-funded activity?

There is an urgent need to critically review the research programmes of these institutions and orientthem towards solving the priority problems with a strong emphasis on optimising the farm incomes from small holdings through sustainable use of natural resources. Most of the institutions have never been subjected to **external peer review** and continue to carry out research on the same topics, sometimes for decades. This results in considerable misuse and wastage of precious human and financial resources.

Educational and research programmes should be closely linked. Farmers need to be fully associated with both the teaching and research functions, and their perceptions should be reflected in the curricula as well as in the prioritisation of the research agenda. Finally, the institutions should be funded adequately so that qualified researchers do not feel constrained to undertake their approved research programmes owing to deficiencies in laboratory, library, or farm facilities. Because of the relative isolation of mountain areas, it is even more essential to provide adequate support to keep the morale reasonably high.

Most of these issues are of concern to the respective countries, but there are areas in which the role of ICIMOD can be envisioned as a catalytic institution; e.g., in facilitating the reformulation of R&D mandates, in taking up the responsibility for giving orientation-training to existing manpower, generating and disseminating information/literature, and cooperating with national institutions to strengthen their capabilities wherever they feel it possible. These are, however, very broad bases for cooperation between ICIMOD and the national institutions, and their specifics would vary from country to country.