# PART 5

# Transformation of Mountain Areas: Some Innovative Approaches

# 25

# ANTI-POVERTY FOCUSSED PROGRAMMES IN THE MOUNTAINS: EXPERIENCES IN CHINA

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## A ROUGH SKETCH OF POVERTY IN CHINA AND ITS BASIC PROBLEMS

### Characteristics of Poverty in Contemporary China

China is still a developing country with many minority nationalities. In comparison to ancient China, where scenes of devastation and accumulating poverty prevailed, we can claim with great confidence that the living standards of the Chinese people have improved gradually. By 1986, China had solved the problem of providing enough to feed and clothe its people. There has also been a fundamental change in the overall situation of poverty and backwardness.

It is necessary to explain that, in China, despite the overall increase in per capita annual income, proportionate development results in discrepancies in the economic status of different regions. Despite the regular increase in average figures, low income continues to be a problem. Therefore, the overall development of the rural economy throughout the Chinese mainland does not mean that China has rid itself of poverty and backwardness. Yet, fundamental changes have taken place in the characteristics of poverty and its implications. By 1986, domestic poverty could be described by referring to three specific types of situations.

(1) Up to 1986, nearly 30 million people were suffering from hunger and were scantily and poorly clothed, living in semi-open adobes or even in huts with dried corn stems as walls.

(2) It is believed that 15 per cent of the total population in rural areas earn half or below half of the average income of the people living in urban areas. Statistics show some 80 million peasants with a per capita net income below RMB 200 yuan (4.73 yuan = US$ 1).

(3) A large number of underdeveloped areas with poor socioeconomic situations were revolutionary bases in the past or are remote hilly areas where minority nationalities live. These areas once played an important role and made great contributions to the establishment of the People's Republic of China. Therefore, successful implementation of development activities focussed on these areas has special significance.

It is believed that the current problem of poverty and backwardness in China can be divided into situations with three types of characteristics.

(1) Absolute poverty, in which situation a labourer can barely earn sufficient income for survival. Farm households are not only production but also consumption units in which a labourer cannot expand the household capital stock, and this determines the poverty status.

(2) Comparative poverty, a historic concept undergoing slow change. Normally it is relative to the bottom 10 to 15 per cent of the population in rural areas.

(3) The poverty-stricken and backward areas, with concentrations of comparatively and absolute poor people. The importance of eliminating poverty at present stems not only from the large number of absolute poverty-stricken people or from the fact that comparative poverty has affected the uniform economic development of the country, but also from the fact that this has affected the social stability and unity of the nation.

## The Distribution of Poverty-stricken Areas

Problems relating to poverty are highly concentrated in the mountainous areas of China. Currently, the poverty-stricken and low income generating populations are concentrated in 18 poverty-stricken contiguous mountain areas. Out of the 664 counties in these areas, 425 are sustained by funds from the central and other levels of government (see Table 25.1). With such a distribution, the problems that need immediate attention are those dealing with poverty in these mountainous areas. The poor areas fall into five categories: (1) old revolutionary bases; (2) minority nationality areas; (3) remote areas; (4) mountainous areas; and (5) backward and underdeveloped areas. As a matter of fact, mountains are the elementary geographical feature of the above five areas.

**Table 25.1. The 18 poverty-stricken contiguous areas**

| Sr. No. | Areas | Provinces | Number of poor counties |
|---|---|---|---|
| 1. | Daba and Qinling Mountain area | Sichuan, Shaanxi, Hubei, Henan | 68 |
| 2. | Wuling Mountain area | Sichuan, Hunan, Hubei, Guizhou | 40 |
| 3. | Wumeng Mountain area | Sichuan, Yunnan, Guizhou | 32 |
| 4. | Dabie Mountain area | Hubei, Henan, Anhui | 27 |
| 5. | Southeast Yunnan Mountain area | Yunnan | 19 |
| 6. | Hengduanshan Mountain area | Yunnan | 13 |
| 7. | Taihangshan Mountain area | Shaanxi, Hebei | 25 |
| 8. | Luliangshan Mountain area | Shaanxi | 21 |
| 9. | Northwest Guangxi Mountain area | Guangxi | 29 |
| 10. | Jiuwandashan Mountain area | Guangxi, Guizhou | 17 |
| 11. | Nuluerhu Mountain area | Liaoning, Inner Mongolia, Hebei | 10 |
| 12. | Xihaigu Mountain area | Ningxia | 8 |
| 13. | Dingxi Mountain area | Gansu | 27 |
| 14. | Tibet | | |
| 15. | North Shaanxi Mountain area | Shaanxi, Gansu | 27 |
| 16. | Southwest-Northeast Fujian Mountain area | Fujian, Guangdong | 23 |
| 17. | Jinggangshan Mountain area | Jiangxi, Hunan | 30 |
| 18. | Yimeng Mountain area | Shandong | 9 |

*Source*: Study team.

## OPERATIONAL CIRCUMSTANCES IN THE 18 POVERTY-STRICKEN MOUNTAIN AREAS

### Constraints

In terms of social and economic development, the 18 contiguous poverty-stricken areas share the following common constraints.

*Poor Infrastructure*

These areas are all plagued by infrastructural problems such as poor transportation facilities, ineffective communication systems, severe shortage of technical personnel, poor skills of farmers, simple and crude medical equipment, and rampant endemic diseases. The 1986 statistics show that 16.1 per cent of the townships in the 664 poor counties could not be reached by highways; 22.2 per cent of the townships did not have electricity; and the average per capita consumption of electricity in the rural areas stood at 30.3 kWh only—55.8 per cent lower than the country's average. A comparative study indicates that, in 1985, there were approximately 68 technical personnel for every 10,000 people in 11 provinces (or autonomous regions) that reported a relatively concentrated poor population (about 23.2% less than the figure of 89 in 10 relatively developed provinces or municipalities); there were 5,000 people with primary school education among every 10,000 people in the 11 poor provinces (18.4% lower than the national average); there were 2,943 illiterate persons among every 10,000 people living in the poor provinces (24.6% higher than the country's average); there were only 21.7 hospital beds for every 10,000 people (9% less than the nation's average); and there were 30.3 medical workers among every 10,000 people (7% below the country's average level). According to a survey of the 109 poorest counties in China, 94 counties or 86.3 per cent of the sampled counties reported the existence of the main endemic diseases such as snail fever, *Keshan*, *Kaschin-Beck*, and fluorine poisoning.

*Grave Ecological Imbalances*

Many of the poor regions suffer from adverse agricultural conditions. For instance, the deep mountain areas suffer from serious soil erosion, the arid areas in Northwest China are frequently afflicted by drought, the karst region in Southwest China lacks both soil and water, and the red soil region in areas south of the Yangtze River and the poor regions in North China almost every year experience natural disasters such as droughts, floods, and severe salinization. Such adverse factors have directly led to a vicious circle of decline in agricultural production due to the ecological degradation experienced.

*Excessive Population Growth*

Studies show that the phenomenon of 'the poorer the people are, the more babies they have' has become widespread in many poor regions. The population growth rate in such regions often exceeds 2—3 per cent, almost 40—100 per cent higher than the nation's average growth rate. This is to a certain extent due to the fact that minority nationalities in China are exempted from the one-child policy.

*Low Level of Social Development*

The low level of social development in poverty-stricken areas, especially in areas

where minority nationalities live, results in slow social development. Before 1949, in some of the poverty-stricken areas of China, social life still bore the characteristics of primitive communes. Social customs, lack of commercial mentality, ways of behaviour, etc., which had primitive communistic characteristics, imposed social restrictions on the development of a commercialized economy. External factors, too, have affected the productive capacity of these areas since 1949.

## Potentials

In spite of the fact that the 18 areas face severe disadvantages, they have some comparative advantages over the plains, such as being specific habitats for special medicinal plants, fruits, and mineral resources. Generally speaking, the 18 areas have the following common potentials for economic activities.

*Abundant Agricultural Resources*

The 18 areas can be divided into six categories in terms of agricultural conditions. Each of them has its own special agricultural resources.

The first category is the border region between Eastern and Western China, including Qingba, Wuling, and Taihang mountain areas. These areas have the advantages of both the mountains and the plains. From south to north, mid-subtropical, north-subtropical, temperate, and central plains conditions prevail and from east to west, this area extends through humid, semi-humid, semi-arid, and arid regions. The diversification of natural conditions as well as the topographies, climates, lands, and resources make these areas suitable for developing forestry, agriculture, and animal husbandry, as well as for the diversification of their economies. To be more specific, in Qingba Mountain area there are 5,000 species of wild plants, including 1,216 varieties of medicinal herbs. There are also 627 species of wild animals, including 42 rare animals. In addition, this area grows and produces mulberry, tea, *Tung* tree, sealing wax, edible fungus, and medicinal herbs. Wuling Mountain area is known for its *Tung* trees, oranges, sealing wax, flue-cured tobacco, and ramie.

The second category is the karst region in Southwest China, including the Wumeng Mountains, the Southeast Yunnan Mountains, the Hengduanshan Mountains, the Northwest Guangxi Mountains, and the Jiuwandashan Mountains. The waterpower potential in this region is the highest in China, accounting for two-thirds of the country's total. However, so far only 2 per cent of the waterpower potential has been tapped. Situated in the humid subtropical zone, it has favourable conditions in terms of water supply and temperature and has mild winters and plant growing seasons. Subtropical perennial plants can be grown widely. This region is also one of the most important bases of forestry and livestock products as well as economic forests. Various native products and medicinal herbs, with the areas they are well suited to, are listed below:

- the Wumeng Mountains—forestry and animal husbandry;
- the Wumeng Mountains of Sichuan Province—flue-cured tobacco, oil-seed crops, fruits, tea, and forests;
- the Wumeng Mountains of Yunnan Province—tobacco, fruits, oil-seed crops, and phosphorus ore;

- the South-east of Yunnan Province—sugarcane, rubber, shellac, tea, coffee, spice, oil-seed crops, hides, Southern Chinese medicinal herbs and fruits; and
- the Hengduanshan Mountains—sugarcane, sealing wax, tea, *Tung* tree, walnuts, and fruits.

The third category is the arid region in Inner Mongolia, that is the Nuluerhu Mountain Area. This region enjoys abundant solar energy resources. It has a large amount of solar radiation due to long hours of sunshine. Besides, this region has a lot of untapped resources such as uncultivated land, grasslands, and woods.

The fourth category is East China's hilly areas, including Dabieshan, Southwest and Northeast Guangdong Province, and the Jinggangshan and Yimengshan Mountain areas. This region abounds in woods such as rainforests on the fringe of the tropical zone, evergreen broad-leaved forests and coniferous forests in the subtropical zone, and deciduous broad-leaved forests in the temperate zone. This region is one of the important forest bases of China. There are plenty of special economic forest products in these mountain areas. In addition, it has an ample labour force. The typical monsoon climate is favourable for agricultural production. This region can exploit and utilize its agricultural, forestry, animal husbandry, and mineral resources. The details are as follows:

- the Dabieshan Mountains—fruits, cattle, rabbits, sheep, geese, bamboo, mulberries, tea, Chinese medicinal herbs;
- the Jinggangshan Mountains—bamboo, tea, citrus fruits, etc.; and
- the Yimengshan Mountains—hawthorn, fruits, etc.

The fifth cateory is the hilly/ravine area on the loess plateau, including Luliangshan, Xihaigu, Dingxi, and the Northern Shanxi Province. This region has vast lands of which 70 per cent is loess, loose, fertile, and cultivable. However, the topography is rather complicated and land here is of various types. Through development, this region can become a mixed farming area for agriculture, forestry, and animal husbandry, as follows:

- the Xihaigu and Dingxi areas—commercial crops such as common flax, sallow thorn, Chinese medicinal herbs, and leather; and
- the North Shanxi Province—abundant flue-cured tobacco and fruits (has a great potential for developing animal husbandry).

The last category is the high mountain region in Tibet. The insolation here amounts to 2,600 to 3,200 hours per year. The percentage of insolation is 60 to 70 per cent. This region has plenty of sunshine. The extensive grasslands with quality grasses provide excellent pastures for animal husbandry. Yaks, Tibetan sheep, and goats are the three main types of domestic animal in this region.

*Mineral Resources Suitable for Exploitation*

There are plenty of mineral resources suitable for exploitation in China's poor mountain areas. For example, in Qinling and Daba, the key mineral resources suitable for exploitation are gold, silver, precious stones, coal, phosporous, cement rock, plaster stone, marble rock, and clay. There are 298 small proven mineral mines and deposits in the area. In the Hengduanshan Mountain area, there are abundant resources of gold,

tin, mercury, stibine, asbestos, serpentine, coal, cement rock, cement burden, lead, and zinc.

*Cheap Labour Force*

Wage rates in the poor mountainous areas are much lower than in the plains areas. This is a very important advantage for the poor mountain areas in developing labour-intensive manufacturing, mining, and infrastructure. The government can mobilize agricultural surplus labour to participate in the construction of public projects such as roads and water conservancy. In recent years, the labour cost in coastal areas has increased very sharply; some labour-intensive production has tranferred from there to the less developed mountain areas. On the one hand the low wage rate is the result of low development, but, on the other hand, the low wage rate is an advantage for development.

## DEVELOPMENT INTERVENTIONS: ANTI-POVERTY PROGRAMMES

### Targets

In 1986, the Leading Group for the Economic Development of Poor Areas under the State Council had stressed that economic development in the 18 poor mountain areas was a long task that would have to be undertaken in two stages. These have been outlined below.

*The First Stage (Near and Short-term Targets)*

Efforts should be made to guarantee that there is enough food and clothing in the poor areas within a relatively short period of time; in other words, before 1990. During normal harvest years, 90 per cent of the people living in the poor areas should have enough food and clothing (except for households living on social welfare and the so-called 'five-guaranteed households', meaning the childless, infirm, and old people who are guaranteed food, clothing, medical care, housing, and burial expenses by the government). All the concerned provinces and autonomous regions should work out their respective standards and set schedules to ensure sufficient supplies of food and clothing in their poor areas according to the above-mentioned basic targets and the status quo of local economic development.

*The Second Stage (Long-term Development Targets)*

When the problem of guaranteeing enough food and clothing to the poor areas has been basically solved, efforts should then be shifted to regional economic development to help those poor areas to establish production bases that rely on local resources, operate on a fairly large scale, and are in conformity with social services. Morever, such areas should develop a series of products and key enterprises, by utilizing local resources and boosting the processing industry, so that they can bring the income level of the local farmer households closer to the average of the local provinces or autonomous regions in order to eradicate poverty as soon as possible.

## MAIN PROGRAMMES

In order to achieve the above targets, the Chinese government has gradually implemented a series of programmes.

### Financial Programmes

*Funding for the 'Three Xi' Special Agricultural Construction*

At the end of 1982, the Chinese government selected Xihaigu area of Ningxia and the adjacent Dingxi area and Hexi area in the middle region of Gansu as key areas to be given financial support. The government developed a 'Three *Xi*'—Ten-Year Development Plan from 1983 to 1992, and the central exchequer gave 2 billion yuan to support the programme. The purpose of this programme is to improve the infrastructure and the agricultural production conditions.

*Fund to Support Underdeveloped Areas*

The Ministry of Finance has been engaged in this programme since 1980, and it will last until the year 2000. The scale of funding is 800 million yuan per year, and its purpose is to promote social and economic development in poor areas.

*Food and Clothing for Labour Services*

From 1985 to 1987, the State offered 2.7 billion yuan of grains, cotton, and cloth as payment for labour services to help poor areas improve transport and water conservation facilities. During the three years, the poor areas in China built and revamped a total of 120,000 km of highways, tractor paths, and post roads (including the construction of 46,000 km of new State-class highways); built 7,200 bridges and 65 wharves; increased irrigated farmland by 172,600 ha and improved 7,033 million ha; repaired and consolidated 558 reservoirs and increased the capacity of generators at small hydropower stations by 1.56 million kW; and solved the water supply problem for 14.5 million people and 9.71 million domestic animals.

*Middle and Low-grade Industrial Products*

From 1989 to 1991 and from 1990 to 1992, the State has allocated middle and low-grade industrial products valued at 600 million and 1.5 billion yuan respectively to further strengthen the transport and water conservancy programmes in order to increase productivity and improve living conditions.

### Credit Programmes

*Special Interest Discount Loans for Poverty Alleviation*

The People's Bank of China entrusted the Agricultural Bank of China to carry out this credit programme from 1986 to 2000. The scale of funding is 1 billion yuan per year. The input principle of this programme is less investment, quick results, easy business for every household, economic benefit to every household, and a solution to the clothing and food problem. Therefore, the priority is crop raising, animal and fish raising, and product processing.

*Special Interest Discount Loans for Poverty Alleviation in Pastoral Areas*

The source and purpose of this programme is the same as the one above. However, the term is from 1988 to 2000 and the scale of funding is 50 million yuan per year.

*County-owned Industrial Loans*

In order to improve the industrial structure, to increase agricultural product processing and the capability to use resources, and to raise the self-support ability of local financial institutions, the State-owned banks have introduced special credit programmes. These include the People's Bank of China, which allocates 400 million yuan annually (1988–2000), the Industrial and Commercial Bank of China, which allocates 300 million yuan annually (1988–2000), and the People's Construction Bank of China which allocates 100 million yuan annually.

*Loans for Development*

From 1984 until 2000, the People's Bank of China and the Agricultural Bank of China have agreed to respectively allocate 1 billion and 300 million yuan annually to boost the local economy in the poor mountain areas.

**Preferential Policy Programmes**

In recent years, the State and provinces (in autonomous regions) have each adopted some new policies aimed at alleviating the burden of the poor areas. The State has decided to exempt the poor areas from agricultural tax for three to five years, starting from 1985. Beginning in 1987, the State has also exempted poor counties that receive key State aid from taxes for energy and transport construction funds, and has lowered the proportion of bank reserves in those areas. At the same time, each province (or autonomous region) has formulated its own preferential policies to offer more benefits to poor areas. For instance, Guizhou Province has decided to reduce or even write off the quotas for grain purchasing contracts between the government and the poor counties; to offer income, product, and operation tax waivers for township enterprises for three to five years in such counties; and to lower the proportion of cash needed by poor farmers who apply for bank loans. In addition, the province has decided to exempt pupils studying at primary schools, at the township level or below, from tuition fees and textbook expenses and to allocate an additional 20 million yuan each year out of the local government reserved funds for economic development in the province's poor counties.

**Mobilization of the Whole Society to Help the Poor Areas**

Since 1986, the State Council has convened two conferences during two consecutive years to hear reports by its ministers and commissions on their efforts to develop the poor areas. The conferences called on the participants to play a leading role in supporting construction and economic development in the country's poor areas and to make greater contributions to this end. Twenty-eight central government departments were cited for their outstanding performance in this field at the conferences. So far, there are 36 State institutions that have established direct relationships with designated poor areas to support the latter's

economic development. Generally speaking, all central government departments have taken active, prompt, and practical steps and have achieved initial results that are quite promising.

Meanwhile, economic development in the country's poor areas has won support from all social circles, including democratic parties and relatively advanced areas, large and medium-sized cities, scientific research institutions, colleges, and universities as well as the People's Liberation Army. Every year, a large number of volunteers, including teachers, doctors, researchers, skilled farmers and workers, and entrepreneurs come to the poor areas from other parts of the country to help formulate local development programmes, train local personnel, diffuse new technologies, and help solve local economic development problems.

## EFFECTS OF ANTI-POVERTY PROGRAMMES

In order to relieve poverty in the 18 mountain areas, the Chinese government has been implementing the above-mentioned anti-poverty programmes since 1985. These have not only proved to be efficient in lowering the incidence of poverty but have also resulted in marked effects on the social and economic development of the poor mountain areas. Poverty is closely connected with the social and economic conditions in these regions, and is an integral part of the social and economic systems. Eliminating poverty will inevitably lead to social and economic changes, more significant than relieving poverty itself when one considers the restriction placed on the development of poverty-stricken mountain areas by their social and economic systems. Therefore, systematic development of poor areas requires a comprehensive plan and steady progress. China has gained noticeable achievements in this field over the past few years. However, due to incomplete statistics, the analysis here had to be based on cases.

### Improved Infrastructure

The infrastructure of poverty-stricken areas is experiencing or will experience big changes. During 1985 to 1987, the Chinese government implemented a programme of Food and Cloth for Labour in association with the building of highways and water conservation facilities in poor mountain areas. This programme has promoted infrastructural construction there. Actually, quite a number of local government departments obtained the necessary materials such as steel, cement, and blasting caps by exchanging the allocated grain, cotton, and cloth. The peasant farmers worked even without pay. Moreover, a large portion of the funds for supporting underdeveloped areas in the State financial budget were used to better the infrastructure, especially between 1985 and 1987, when the funds were jointly used with the grain, cotton, and cloth mentioned above as a complete package in many areas.

For example, from 1985 to 1987, the following work was completed in the Yimengshan Mountain area in Shandong Province.

- The nine poor counties in the area completed 1,497 schemes for water facilities. Among them were 380 ordinary wells, 212 motor-pumped wells, 99 pumping stations, 710 cisterns, 90 diversion works and supportive facilities, and a 138.5 km long

pipeline. A total of 238,000 people in 469 villages, or 19.5 and 21.5 per cent of the total population and villages, respectively, have benefited from these projects.

- The counties built 15,576 new schoolhouses and added facilities to existing ones. Compared with 85 per cent in 1984, 90 per cent of all school-aged children are now in school.
- More than 1,400 km of highways connecting county towns and smaller towns and 11,000 km of roads among the villages were built. Buses now have access to nearly half (1,903 villages) of the total number of villages previously not open to traffic.
- Newly erected power transmission lines transversed 183 km. They have enabled 1,058 villages to use electricity (30% of the total unelectrified villages in 1984).
- Also erected were 1,885 km of broadcasting line which made it possible for 801 villages (19.4% of those without) to receive broadcasts.

Government departments concerned with infrastructural construction have contributed a great deal to the improvement of living conditions in the poor areas. The Ministry of Communications, for example, drafted its Seventh Five-Year Plan (1986–1990) to improve communications in these areas. The plan included 18 large or medium-sized highways (8,500 km) and an investment of 190 million yuan in highway and waterway traffic below county level. The Ministry also allocated 10 million yuan for railways, 2,000 traffic management personnel and technicians for 201 needy counties in 12 provinces and autonomous regions, and 50 million yuan to improve local traffic conditions. The former Water Conservancy and Electric Power Ministry's plan to assist poverty-stricken areas covers the years up to 2000. In 1987, the Ministry set aside 13 million yuan to help poor counties across the country to build one or two small projects each. Another 2 million yuan for five needy counties in the Three Gorges Area went to construct drinking water facilities for 40,000 people and 30,000 domestic animals. The Ministry also provided 12 billion kilowatt-hours of electricity to people situated far away from reservoirs and 70 million killowatt-hours to old revolutionary bases, remote areas, and minority areas. A total of 166 million yuan was allocated by the Ministry to construct more than 30 power generating projects. Another 32 million yuan was provided for 36 counties in the country which were experimenting with electrification. Ten other poverty-stricken counties in Sichuan and Jiangxi provinces and Ningxia Hui Autonomous Region received more than 60 million yuan to help build power stations.

### Closed and Semi-closed Conditions Undergoing Changes

Most of the poverty-stricken mountain areas are closed or semi-closed to the outside world and live within traditional social and economic systems. Their few contacts with other parts of the country and the world outside have strong administrative characteristics. Previously, the connections of these areas with the outside world were limited to the transfer of public employees, raw materials, and consumer and relief goods. All these aspects are constrained under their economic and social systems. For reasons such as these and inaccessibility these areas became more isolated, until recently, when the government strengthened its aid to poverty-stricken mountain areas, resulting in a gradual increase of the social and economic contacts and a break down in the closed or semi-closed conditions.

One way to alleviate such conditions in poor areas is to provide advanced areas with

surplus labour from the poor ones. The Jinggangshan Mountain Economic Development Working Group of the Ministry of Civil Affairs helped send more than 5,000 people from the region to work in other parts of the country, and this stimulated local labour emigration. Through these labourers, local people changed their ideas and increased their income, broadened their perspectives, and trained skilled personnel.

Another method of breaking the closed and semi-closed conditions is to introduce personnel, technologies, information, and management experiences from the advanced areas to the impoverished areas. A noticeable trend in advanced regions is that some local crafts and industries, such as straw weaving and carpet weaving, are now gradually moving to poor areas due to rising production costs, especially rising labour costs. The transfer of such industries to different regions is due to economic pressures. Administrative forces play no role here. The poverty-stricken areas were involved in the labour division system in the national economy. Technical personnel go to poor areas to establish township enterprises through contracts and promote technology in agricultural production, playing an important part in opening up these areas.

The breaking up of closed and semi-closed conditions has given a great impetus to the development of the market economy in poverty-stricken areas. To receive government assistance a product must be able to earn profits, since the aid has changed from grants to loans. As the government has its assistance, the previously autarkic economy in poor areas has started to integrate with the market economy. The development of the market economy, in turn, further breaks down the closed and semi-closed condition of the impoverished areas. The development of the market economy and the breaking down of closed conditions complement each other.

**The Economic Behaviour of Poor Families**

The economic behaviour of poor families has changed greatly due to the government's policy adjustment on assistance. They are gradually adjusting to the standards required by the market economy. Linqu County in the Yimengshan Mountain area, for example, reclaimed 20,600 ha of undeveloped hills, slopes, sands, and water during 1985 and 1986. They included 3,000 ha of timber forests, 234 ha of water to raise fish and lotus roots, and 7.07 million fruit trees of various kinds. The County also built 2,520 km of mountain roads and completed 1,801 new water conservation projects. The total man-hours spent on such projects by local farmers was 336 million or 1,016 for every farmer on an average. The farmers were enthusiastic and their work was of unprecedented speed and quality. This time, instead of external political pressure for self-supply, it was the internal economic impetus and impulse for expansion that governed the farmers' enthusiasm. In the late 1950s and 1970s, the people's political responsibility directed their economic behaviour and they scarcely cared whether what they were doing would benefit them or not. The change in policy brought out changes in the farmers' economic behaviour. Improvements in the external economic environment, such as the service system, marketing channels, and so on, resulted in a rise in the farmers' marginal propensity to invest. Farmers became more and more interested in self-development.

According to our investigation, the 'minimum critical level of consumption' is 150 yuan of per capita annual consumption. Below that income level, farmers use outside funds to satisfy their most elementary consumption needs. If their per capita annual

income is more than 150 yuan, they use the surplus money either on improving living conditions or on investment.

## Scope for New Economic Growth and Training Pioneer Entrepreneurs

The government's policy of helping poor areas to set up economic concerns and, through them, providing poor farmers with enough to feed and clothe themselves, has helped to widen the scope for new economic growth and to train pioneer entrepreneurs. The poverty-relief organizations promoted local economic improvement through investment. Our investigation into 27 poverty-relief organizations in the Luliang Mountain area in Shanxi Province gave us a general idea of how such activities are promoting regional economic development.

At present, we cannot exactly estimate the revenue change in these counties, but increases in investment are affecting revenue in two ways: (1) they offer new markets to local products, thus upgrading the regional economy through demand increase, and (2) the investments provide more productive materials for local areas, thus pushing the regional economy ahead. We can analyse the effect of aided businesses, through the integration with the local market, on the economy in poor areas. Table 25.2 shows those businesses that obtained 68 to 98 per cent of their inputs locally, and sold 47 to 66 per cent of the output in local markets. The poverty-relief organizations become growth points of the regional economy.

**Table 25.2. Sources of input for and purchasers of output from enterprises developed with poverty-relief funds**

| County | Number of organizations sampled | Sources of raw materials consumed by organizations(%) | | Purchasers of output (%) | |
|---|---|---|---|---|---|
| | Within county | Outside county | Within county | Outside county | Within county |
| Linxian | 13 | 68 | 32 | 63 | 37 |
| Xingxian | 9 | 84 | 16 | 47 | 53 |
| Kelan | 5 | 98 | 2 | 66 | 34 |
| Total | 27 | 79 | 21 | 59 | 41 |

At present the government pays special attention to establishing two types of enterprise, processing enterprises which can purchase raw materials from nearby poor families, such as farm produce and raw minerals, and enterprises that employ families for processing, such as carpet weaving. The government also trained a group of entrepreneurs for needy areas by establishing the organizations needed. The managers of these poverty-relief organizations were village cadres or soldiers who had been to places outside the counties. Those who had matured through years of managing experience were the elite among the local people. The establishment of an entrepreneur stratum has undoubtedly had a positive effect on local economic development.

### Traditional Culture: Confronted with Forceful Challenges

Traditional culture in poverty-stricken areas faces strong challenges as the market economy develops and outside contacts increase. Many cultural ideas and social customs unfit for the development of a market economy have gradually changed. Economic development promotes social progress.

For example, while the agricultural surplus labour in coastal areas was turning to industry and commerce, people in poor areas resisted labour emigration, because they regard working outside as the 'selling of labour and being exploited' and being children's nurses in urban families as 'being slaves'. However, years of effort from the cadres sent by the government to aid the impoverished areas, and success stories from the first group of labourers who left the areas, have led to obvious changes in the local people's ideas. Many of them have now begun to be active in registering for work outside, but previously they believed that all businessmen were treacherous. When they occasionally sold some goods at country fairs, they would avoid forming relationships with outsiders. Mostly the surplus goods were given to relatives or neighbours. Such things are rarely seen nowadays. People are gradually basing their principles on the market economy and selling more goods instead of sending them out as gifts. We discovered an interesting 'toilet revolution' in the Luodian area of the mountains of Southern Guizhou Province, inhabited by the *Buyi* and *Miao* minority nationalities. People here regard human waste and domestic animal waste as too dirty to be used for farming and for quite a long time have had neither toilets nor stys. But vegetable experts in the Scientific Institute of Agriculture of the Province helped local peasants grow early maturing vegetables, suited to the county's high temperatures in spring and winter. The vegetables fill a seasonal vacancy in the markets. Fertilizer application then became a must since vegetable growing there was intensive. As a result, every household started to build toilets and stys in pens, leading to the toilet revolution. The local government had long advised people to do this, but without success. The experience was enlightening. Only through the demands of the market economy can there be any fundamental change in the traditional concepts of value, thinking habits, and modes of behaviour which gives rise to social evolution.

## CONCLUSIONS AND SUGGESTIONS

### Conclusions

From the Chinese government's anti-poverty programmes mentioned above, we can sum up the main successful experiences.

*Anti-Poverty through Economic Development*

In the past three decades, the State spent a lot of money and effort in helping development in poor areas and in solving the key problems of poverty. Though there were some achievements, overall, the results were not satisfactory. The main problem was that most of the money was used for temporary relief work instead of for investment in efforts to help poor areas and poor farmer households to build the capability for self-development. Therefore, such aid not only failed to solve the basic problems of the efficiency of fund use and the augmentation of local production, but also encouraged

some areas and farmer households to be dependent on the government. After realizing the drawbacks in its old policies, the State Council decided to make substantial adjustments in its policies for poor areas by shifting the policy focus to development and reform. The new economic development policy for poor areas calls for efforts to arouse the initiative of the cadres and the masses in the poor areas; bring into play the spirit of self-reliance; stimulate such areas' internal vitality for economic development; conduct development production and construction by tapping abundant local natural resources with necessary State support; and gradually help poor areas to form the capability for self-development in introducing a commodity economy, solving the problems of shortage of food and clothing, and eradicating poverty.

*Increase of Investment Intensity*

Considering the economic characteristics of the poor households, the government holds that poverty-relief funds should be used according to the nature and priorities of the national policies, and the 'super-stabilized structure' of poverty should be broken down. If the funds are equally distributed, the 'minimum consumption trap' cannot be avoided. And, as a result, the economic development approach may not be effective.

As an alternative to consumption subsidy, the government, through village and township institutions, buys some productive inputs and distributes them to poor households instead of giving them cash. This enables the poor to expand reproduction under a condition of low-level consumption. If specific restraints are not placed on the use of poverty-relief funds, the minimum consumption trap may not be overcome. Such tendencies are contrary to the purpose of an economic development approach.

*Introduction of the 'Project Management' Method*

Project management is one of the major contributions made by the World Bank to global economic development. The World Bank has accumulated a lot of experience in project management. The Chinese government introduced this method in its poverty-relief efforts and issued 'Provisional Regulations on Project Management in Poor Areas'. Project management is an effective way to approach poverty relief. Distributing funds according to project priorities not only improves the efficiency of fund use, but also avoids misuse and embezzlement of poverty-relief funds.

*Strengthening the Organization of Economic Development*

Since China has long practised centralized planning, even in remote poverty-stricken areas, administrative institutions are well-established. With the economic reforms that have taken place in the past few years, this extensive government network has an important role to play in organizing poor households to participate in economic development by helping them with planning, project selection, and implementation. The State cannot do a good job in the area of poverty relief without the participation of local organizations.

## Suggestions

Currently, China is undertaking economic and political reforms, and, although the Chinese government has made many adjustments to its anti-poverty programmes, further improvements are still necessary and urgent.

*Adjustments in the Industrial Structure*

To develop the economy in poverty-stricken areas, appropriate industrial policies are needed. The poverty-stricken areas have devoted most of their resources to grain production and their natural ecological balance has been destroyed. This leads to low grain production and slow development of non-agricultural undertakings and rural industries. Recently, with the adjustment in the industrial structure, the poverty-stricken areas have begun to pay attention to the development of non-agricultural undertakings and rural industries. However, some areas seem to go too far. A tendency to neglect grain production is emerging. Industrial policies with flaws mean failure in economic development. Therefore, we must be clear about the basic aspects of industrial policies.

*Ensuring Food Sufficiency by Increasing Supplies and Cutting Demands*

The grain production situation all over the country cannot be viewed optimistically. It is very difficult for the government to allot grain in large quantities to the poor areas, even when the country on the whole enjoys a large supply of grain, because of transportation difficulties and price differences. So self-sufficiency remains the basic target of the country's food policy for poverty-stricken areas. Measures to secure food sufficiency include: (1) employment of cheap labour to undertake farmland capital construction and gradually improve agricultural production conditions and (2) transformation of traditional production with high technology and sophisticated equipment and extension of quality strains and intensive farming to increase per unit yield. Measures to cut demands for grain include appropriate control of industries, while greatly increasing pastured livestock, poultry, and fruit-based wine making.

*Developing Rural Industries and Household Agricultural Undertakings*

Efforts should be made gradually to transfer the labour-intensive and less profitable industries of the developed areas to poverty-stricken areas. Obviously, poor areas have a large, cheap labour force. We should take advantage of this in the national division of labour.

*Promoting Labour Emigration*

Unemployed and under-employed labour resources constitute a big waste in poor mountainous areas. Emigration of labour not only provides employment and income but also eases the population pressure on natural resources. Labour emigration is an industry with economic, social, and ecological benefits. While forming industrial policies, priority should be given to it.

*Restraining the Government's Economic Behaviour*

Local government departments, especially those with county-relief funds, currently independently design projects. The local officials tend to initiate projects that will bring large profits rather than those that will benefit the poor. To understand the local officials' preference, we must analyse the budgets and expenditures of the local governments.

At present, many counties have deficits due to excessive expenditure and low revenue. Some counties cannot balance their budgets, even with their superior government subsidies. Budget limits are often exceeded. Administrative, educational, and operational funds account for the high expenditure. We can see that government officials and the

non-agricultural population are closely linked to the budget expenditures. Budget deficits affect the welfare of this group. This explains why government officials prefer to initiate projects that can generate tax revenue.

Having understood the features and motives of local officials, we suggest that the following two measures be adopted to guide them. On the one hand, the examination and supervision of projects should be enhanced and the poverty-relief funds from the central and provincial government invested in projects that are developed to solve food and clothing problems for poor households. In the process of analysis, special attention should be paid to the distribution of project benefits. On the other hand, the special conditions in poverty-stricken areas should be taken into account by the central and provincial governments while macro-economic policies are being formulated, and the problems, despite difficult conditions, should be solved. For instance, it is irrational for the central government to offer uniform loans to the localities. Regulations should differ among different areas. If the central and provincial govenments extend some more financial allowances and special care to the counties needing relief in mountainous areas, the unfairness of the government officials using funds to enrich the county will be eliminated and more funds will be used to solve the problem of basic needs. Poverty relief in mountainous areas will thus be greatly accelerated.

The thrust for county enrichment is understandable, but it should be guided by the future strategy in economic development. Future plans might be based on the attainment of basic needs but the emphasis on poverty-relief work should gradually change from the support of poor households to regional economic development on a large scale. Transition of strategies can only be realized step by step. The implementation of the strategy should be guided according to the differences between regions.

*More Emphasis on Training in Anti-poverty Programmes*

In order to raise the executive efficiency of anti-poverty programmes, the Chinese government pays due attention to personnel training. However, the training activities conducted in the past few years were mainly for leaders. Farmers' training has been neglected to a great extent. We believe that training priority should be given to farmers who are directly involved in anti-poverty programmes. The basic principle should be to train those who implement programmes and to train those needed for the anti-poverty programme.

# 26

# THE EXPERIENCES OF AN AREA-BASED DEVELOPMENT STRATEGY IN HIMACHAL PRADESH, INDIA

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## INTRODUCTION

Himachal Pradesh is a small Indian state situated in the heart of the Western Himalayas. Its entire territory is mountainous with altitudes ranging from 350 m to 7,000 m. It has a total population of 4.28 million (0.63% of the total Indian population) settled throughout the valleys and on the mountain slopes and ridges in 16,916 villages and 39 towns. Tables 26.1 and 26.2 give the population figures of specific areas of the Indian Himalayas and a demographic profile of Himachal respectively. There are no indications of plentiful arable land holdings and rich farmers. The data clearly show that, in terms of fertile land, resource scarcity, the size of land holdings (Table 26.3), and irrigation, Himachal is no different from other mountain areas of the Hindu Kush-Himalaya region.

**Table 26.1. The Indian Himalaya: area, population, villages, and political units (states)**

| Political units/states | Geographic area (sq km) | Population in millions (1981) | Population density per sq km (1981) | Number of villages (1981) |
|---|---|---|---|---|
| *Western Himalayan zone* | | | | |
| Jammu and Kashmir | 222,236 | 5.987 | 43.09 | 6,503 |
| Himachal | 55,673 | 4.281 | 76.89 | 16,916 |
| Hill areas of Uttar Pradesh | 51,125 | 4.835 | 94.59 | 15,010 |
| *Eastern Himalayan zone* | | | | |
| Sikkim | 7,299 | 0.313 | 42.88 | 405 |
| Meghalaya | 22,489 | 1.336 | 59.41 | 4,583 |
| Tripura | 10,477 | 2.053 | 195.95 | 4,727 |
| Manipur | 22,356 | 1.421 | 63.56 | 1,946 |
| Nagaland | 16,527 | 0.775 | 46.85 | 960 |
| Mizoram | 21,087 | 0.494 | 23.42 | 229 |
| Arunachal Pradesh | 83,578 | 0.637 | 7.62 | 297 |
| Hill areas of Assam | 15,212 | 6.3 | 7.62 | 1,931 |
| Darjeeling Hills of West Bengal | 2,417 | 0.507 | 209.76 | 507 |
| Total for Indian Himalaya | 530,476 | 28.939 | | 54,014 |
| Total for India | 3,287,263 | 685.185 | 208.4 | 575,000 |

*Source*: Compiled from *Agroclimatic Zones: Profiles and Issues* ARPU Working Paper No. 2 Planning Commission, India, ARPU, Ahmedabad, 1989 and other sources.

But if the human development process, in terms of available choices and access to resources essential for a decent standard of living, is any gauge (UNDP 1990), then Himachal as a state seems to have achieved better results than many other mountain areas within the HKH region (Tables 26.4 and 26.5). Appropriate development planning enabled the state to accomplish a rapid transformation within a short period of two decades. Today, by and large, people living in the state have access to essential comforts and therefore a better standard of living. Singh (1989), while reporting on the progress made by Himachal, stated that it belies the myth that mountain regions are condemned to be poverty stricken because of their geography. Development observers consider the State to be an example of a success story in terms of development planning for mountain areas, because Himachal provides its people with higher incomes, better employment

**Table 26.2. Himachal at a glance**

| | | Year 1984/85 |
|---|---|---|
| Total area | | 55,673 sq km |
| (Survey or General of India) | | |
| (By village revenue records) | | 3,215,375 ha |
| Forests | | 874,331 ha |
| Total cropped area | | 988,059 ha |
| Net area sown | | 580,025 ha |
| Gross irrigated area | | 169,007 ha |
| Percentage of the gross cropped area | | 17.2 |
| Net area irrigated | | 95,044 |
| Percentage of net area sown | | 16 |
| Intensity of cropping | | 170.4 |
| Total output of food crops | | 1,061,034 MT |
| Total output of non-food crops | | 4,772 MT |
| Population | 1991 | 1981 |
| Persons | 5,111,079 | 4,280,818 |
| Male | 2,560,894 | 2,169,931 |
| Female | 2,550,185 | 2,110,887 |
| Density of population per km$^2$ | 92 | 77 |
| Decennial growth rate (1981–91) | 19.39% | 23.71% |
| Sex ratio (number of females per one thousand males) | 996 | 973 |
| Literacy rate | 53.29% | 42.48% |
| Percentage of rural population | 92.0 % | 92.39% |
| Percentage of scheduled castes | | 24.62% |
| Percentage of scheduled tribes | | 4.61% |
| Number of districts | | 12 |
| Number of households | | 783,974 |
| Number of villages 1981 census only | | |
| Total | | 18,721 |
| Inhabited | | 16,807 |
| Uninhabited | | 1,914 |
| Total livestock population (based on Thirteenth Livestock Census, 1982) | | 4,988,540 |

*Source*: Annual Season and Crop Report for Himachal Pradesh, 1984/85. Directorate of Land Records, Himachal Pradesh.

opportunities, superior social services to meet local development needs, a responsive planning and administrative apparatus, and an enthusiastic political culture. The State has created a new concept in the development of hill economies through the transformations brought about in agriculture, horticulture, and animal husbandry. Development of an extensive infrastructure and the harnessing of the natural resources of the mountains, along with the necessary precautions against negative side-effects, are the noteworthy aspects of these development initiatives. The significant point is that this success has been achieved without using the conventional strategies which focus mainly on industrialization. Finally, whereas the dominant picture characterizing most of the mountain areas in the HKH region reflects a state of stagnation, Himachal's achievements appear unique.

**Table 26.3. Status of farmers and farming**

| | |
|---|---|
| Total area of operational holdings (Agricultural Census, 1981) | 980,425 ha |
| Average size of land holding of the family (1984/85) | 1.5 ha |
| Average number of *parcels* per land holding (1984/85) | 6 |
| Average area per *parcel* (1984/85) | 0.26 ha |
| Marginal farmers (below 1 ha) (1984/85) | 52.2% |
| Small farmers (1–2 ha) (1984/85) | 22.0% |
| Semi-medium farmers (2–4 ha) (1984/85) | 15.1% |
| Medium farmers (4–10 ha) (1984/85) | 6.6% |
| Larger farmers (above 10 ha) (1984/85) | 1.1% |
| Gross irrigated area (1987/88) | 147,900 ha |
| Net Irrigated area (1987/88) | 98,026 ha |
| Total output of food crops (1987/88) | 892,700 MT |

*Source*: Annual Season and Crop Report for Himachal Pradesh, 1987/88. Directorate of Land Records, Himachal Pradesh.

**Table 26.4. Basic indicators of growth in Himachal Pradesh**

| Indicators | 1967/68 | 1972/73 | 1982/83 |
|---|---|---|---|
| Population (millions) | 3.22 | 3.57 | 4.28 |
| % of population living in rural areas | N.A. | 94.97 | 92.38 |
| Population density/km$^2$ | 57.8 | 64.5 | 77.0 |
| Net State Domestic Product (Rs in millions) | 1,830 | 2,391 | 2,969 |
| Per capita income (Rs/yr) | | | |
| (a)at current prices | 528 | 769 | 1,658 |
| (b)at 1970/71 prices | 568 | 669 | 686 |
| Literacy rate | 21.27 | 31.96 | 42.48 |
| No. of doctors per million of population | 21.8 | 203 | 296 |
| No. of hospital beds per million of population | 1,440 | 1,270 | 1,355 |
| No. of hospitals and dispensaries | 480 | 590 | 831 |
| % of villages electrified | 6.15 | 24.83 | 75.63 |
| Per capita domestic consumption of electricity (kWh) | 3.1 | 5.6 | 75.63 |
| Electricity generated (million kWh) | 3.7 | 162.6 | 540.5 |
| Mileage of roads (km) | 4,308 | 7,609 | 13,600 |
| (a) Per 100 sq km of area | 8.72 | 16.85 | 24.44 |
| (b) Per thousand of population | 1.51 | 2.61 | 3.18 |

*Source*: Statistical Outline of Himachal Pradesh (various issues). Shimla: Directorate of Economics and Statistics, Himachal Pradesh Government, 1985.

**Table 26.5. Selected socioeconomic indicators for hilly regions of the Indian Himalaya in comparison to Himachal**

| Regions/ states | No. of villages (1981) | Surface road length 1,000 sq km. (1980–81) | Electricity consumption per capita kWh (1977–78) capita | Villages supplied with electricity % (1984) | Post offices 1,000 pop. (1984) | Educational institutions pop. 1,000 (1981'–82) | | Public health facilities 1,000 pop. (1983) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Primary | High School | Hospitals | Dispensaries | PHC |
| *West Himalayan zone* | | | | | | | | | | |
| Jammu and Kashmir | 6,503 | 5.2 | 65.0 | 85.2 | 0.22 | 1.25 | 0.48 | 0.06 | 0.11 | 0.02 |
| Himachal Pradesh | 16,916 | 35.4 | 54.2 | 83.7 | 0.55 | 1.46 | 0.48 | 0.01 | 0.26 | 0.02 |
| | | 38.2[1] | 147[2] | 100[3] | 0.50[3] | 1.45[3] | 0.41[3] | 0.01[3] | 0.13[3] | 0.03[3] |
| Uttar Pradesh hills | 15,010 | 24.3 | 82.5 | 35.4 | N.A. | 0.02 | 0.04 | 0.10 | 0.26 | 0.02 |
| West Himalayas | 38,429 | 21.6 | 67.3 | 68.1 | 0.4 | 0.9 | 0.3 | 0.03 | 0.21 | 0.02 |
| *East Himalayan zone* | 575,540 | 21.8 | 18.5 | 33.0 | 0.2 | 1.48 | 0.53 | 0.01 | 0.12 | 0.04 |
| Sikkim | 405 | 14.5 | 30.2 | 38.0 | N.A. | 1.49 | 0.28 | 0.02 | 0.15 | 0.09 |
| Meghalaya | 1,931 | 8.4 | 24.8 | 58.8 | 0.01 | N.A. | N.A. | 0.01 | 0.08 | 0.06 |
| Assam Hills | 1,946 | 26.1 | 4.5 | 20.3 | 0.28 | 2.01 | 0.51 | 0.01 | 0.15 | 0.09 |
| Tripura | 4,727 | 74.7 | 9.3 | 17.0 | 0.25 | 1.36 | 0.25 | 0.01 | 0.15 | 0.01 |
| Nagaland | 960 | 35.3 | 23.3 | 93.7 | 0.21 | 1.46 | 0.54 | 0.04 | 0.15 | 0.02 |
| Mizoram | 229 | 5.4 | 5.3 | 13.3 | 0.82 | 1.57 | 0.92 | 0.02 | 0.31 | 0.04 |
| Arunachal Pradesh | 297 | 15.7 | 38.1 | 21.4 | 0.38 | 1.47 | 1.02 | 0.03 | 0.10 | 0.07 |
| Darjeeling W.B. | 507 | 2.9 | 6.5 | 11.4 | 0.24 | 1.98 | 0.30 | 0.01 | N.A. | 0.02 |
| Indian Himalayas | 613,969 | 21.1 | 42.3 | 50.5 | 0.3 | 1.19 | 0.4 | 0.02 | 0.16 | 0.03 |

[1] For the year 1984/85

[2] For the Year 1986/87

[3] For the year 1988

*Source*: *Compiled from Agrocliniatic Zones: Profiles and Issues*. ARPU Working Paper No. 2. Planning Commission, India, ARPU Ahmedabad 1989 and other sources.

## THE VISIBILITY OF SUCCESS

The indicators of success in Himachal Pradesh are numerous and varied, depending upon the interests and capabilities of the evaluators. For instance, the availability of one horticultural product, i.e., apple juice, at practically every railway station or major bus stand and airport in India is a symbol of success for the State and for the common man. The electrification of villages, the elimination of landlessness in rural areas, the extensive network of all-weather roads, the transformation of extensive wastelands into productive orchards, the increased marketability of hill products, fair prices for producers, generally improved incomes, and access to communication, education, and health facilities are some of the major indicators of transformation of interest to those researchers who like to define development in terms of qualitative changes. Singh (1989) reported that signs of Himachal's development were not simply statistical but concrete. He described this visibility of success in the following ways. 'Grocery stalls in the interior towns are full of easily affordable fresh produce. The government ration shops dispense basic cereals at cheap prices. The highways are wide and roomy by hill standards and are equipped with large night-time reflectors that are more commonly found on European motorways. While cooking gas is rarely found in most Himalayan urban centres, red natural gas canisters can be seen everywhere even in the most remote areas of Himachal. Even the street vendors have discarded kerosene and firewood in favour of the clean blue flame. For statisticians and economists, the State provides time series and other data on almost every aspect of economic research. Statistics show clearly that the people have a development record unequalled throughout the Himalaya. They had a literacy rate of 43 per cent compared to that of 40 per cent for the affluent Punjab and an Indian national average of 35 per cent in 1981. Safe drinking water is provided to 93 per cent of the population. For planners from Nepal, Bhutan, Tibet, and the other hilly states of India, these statistics are staggering.' The quantitative dimensions of change will be presented later while discussing the factors and processes behind Himachal's success.

## FRAMEWORK FOR ASSESSING DEVELOPMENT

Depending upon the nature of the enquiry and the sectoral affiliations of commentators, a large inventory of factors contributing to the achievements of Himachal can be found. However, to derive meaningful lessons and replicable experiences from Himachal, the whole process of change has to be analysed within an integrated framework. This framework, as outlined by Jodha (Chapter 2), consists of a development approach based on the mountain perspective. By mountain perspective, one means that one applies explicit or implicit considerations of specific mountain characteristics and conditions while designing and implementing development options. These mountain characteristics are: inaccessibility, fragility, marginality, diversity, 'niche', and people's adaptation mechanisms. As listed by Jodha (Chapter 2), these characteristics generate a number of objective circumstances. The latter act as sources of constraints and opportunities in mountain areas. The appropriate handling of constraints and the harnessing of opportunities are the basic factors behind successful development in mountain areas. Himachal's development performance has been summarized in an ICIMOD Workshop Report (1990). In the following discussion, we will examine Himachal's development experience within the

context of the above framework. In other words, we will consider how mountain specificities were understood and applied, while planning and implementing the programmes in Himachal, in order to make a successful case of mountain area development. We use 'area development' in the sense that Himachal is completely a mountain area and that, despite its internal heterogeneity, an integrated perspective was followed while designing its development strategies.

For further enquiries into a mountain perspective-based development approach the more detailed hypothetical queries would be as follows:

(1) To what extent were mountain constaints, such as inaccessibility, marginality, and fragility, overcome through development interventions?
(2) How were mountain characteristics, such as agro-ecological diversity and 'niche', which offer several unique opportunities and have comparative advantages over the plains, harnessed by the State?
(3) In what way has exploitation of natural resources through development interventions affected sustainability and the quality of life issues in order to make Himachal a successful case of mountain area development?

The development scenario in Himachal Pradesh shows that the constraints and opportunities provided by mountain specificities are not uniform. Their scales would differ from area to area. It is these scales of impact of mountain specificities which decide the priorities for appropriate development in a particular area. This paper explains how Himachal successfully identified the right development priorities leading to the desired impacts.

## DIMENSIONS OF SOCIOECONOMIC MARGINALITY AND APPROACHES

The marginality of mountain populations from the mainstream sociopolitical culture is widely accepted. It is one of the basic reasons for the general neglect of local, need-based development in mountain areas. Remedial measures warrant an understanding of the adaptations to changing circumstances. Himachal Pradesh is no exception to this mountain characteristic. It was recognized as a major constraint in the progress of the State as soon as Himachal came into existence (Singh 1988).

### The Struggle for Statehood (1947–1971)

From 1947 to 1971, the hill communities of this mountain area fought a peaceful struggle against sociopolitical marginality (Singh 1988). The aim of this struggle was to receive recognition from the Indian Union as an autonomous state capable of managing its own governance and development planning affairs. From 1948 to 1951, while India was trying to organize itself as an emerging democratic nation, the small princely states of Himachal were merged into a single hill state, as a consequence of demands from the local mountain communities. It led to the direct administration by the Government of India, which meant a negligible role for the local people in development planning. The administrative system was changed in 1951 when Himachal became a 'part C' state, with an elected government under the control of the Lieutenant Governor. It had the opportunity to launch its First Five Year Plan (1951–1956). Priority was given to the development of roads, education, agriculture, and public health. Because of the limited resources and powers of

the state government, the implementation of programmes was not satisfactory. Eventually, political autonomy and a free hand in development planning were achieved when Himachal Pradesh was declared a Union Territory in 1956. A territorial council was established to comply with the people's demand for representation in the development and planning process. The second five-year plan was launched during this period without any significant achievements. In 1963, the status of Himachal Pradesh was again upgraded. It was given a legislative assembly and a popular government. The third five-year plan was launched during that period and it continued the trend of giving priority to roads, followed by horticulture and hydropower development.

Until 1966, a major part of the present-day Himachal was under the administrative control of the Punjab, a prosperous state in the northern Indian plains. The people of the hilly area of the Punjab and the then Himachal made joint efforts to put forward a case for the merger of these areas into one mountain state. In 1966, this demand was accepted by the Government of India. The hill districts of the Punjab were merged with those of Himachal Pradesh in 1966, doubling its population and its size, which increased from 27,000 sq km to 55,673 sq km. The final step in the removal of sociopolitical marginality was accomplished when Himachal Pradesh became the 18th full-fledged state of the Indian Union and was granted autonomy in political, administrative, and development planning processes.

## Post-1971 Focus on Underprivileged Sections of Mountain Society

The issue of socioeconomic marginality within Himachal Pradesh is also equally important. It has a sizeable population of tribal people, backward classes, and scheduled castes (Joshi 1984). The majority of these three categories of people lived below the poverty line and were not included in the mainstream. For the sake of convenience, each of these marginal communities is discussed separately.

### *Tribal Areas*

The tribal areas of the state constitute 42.49 per cent of its geographical area and 3.13 per cent of its total population (Table 26.6). Physical inaccessibility, remoteness, conservatism, poor mobility, severe climates, sparse populations, and centuries of alien rule had resulted in the marginalization of these areas from the mainstream. Glaciers, high altitudes, and extremely rugged terrain, transversed by fast-flowing rivers and their tributaries, are the striking features of the tribal belt. Some of these areas remained inaccessible for more than six months a year, and this has far-reaching effects on the socioeconomic conditions of these people. The economy of tribal areas was predominantly agro-pastoral.

Initial efforts for the development of the tribal areas started in 1955 in the form of 'Special Multipurpose Tribal Development Blocks'. However, such programmes were run in an *ad hoc* manner, mainly in the form of welfare schemes, without considering the mountain specificities of these areas. As such, there was no visible impact on the quality of life of the people belonging to scheduled tribes up to the period of the fourth five-year plan. A new strategy for the development of these tribal areas was implemented from the beginning of the Fifth Five Year Plan. The salient features of this strategy were:

— Division of all tribal areas into two categories, i.e., areas with more than a 50 per

**Table 26.6. Statistical profile of tribal area**

| Item | Unit | Ref. | Tribal | H.P. |
|---|---|---|---|---|
| Area | Sq km | 1981 | 23,654 (42.49) | 55,673 (100.00) |
| Population | No. | 1981 | 133,432 (3,13) | 4,280,818 (100.00) |
| Density of population per km$^2$ | No. | 1981 | 6 | 77 |
| Scheduled tribe population | % | 1981 | 77.52 | 4.61 |
| Decennial growth rate | % | 1971–1981 | 17.14 | 23.71 |
| Workers | % | 1981 | 57.91 | 42.38 |
| Agricultural Workers | % | 1981 | 63.99 | 70.81 |
| Literacy | % | 1981 | 30.73 | 42.48 |
| Cultivated area agricultural workers | ha | 1980–81 | 0.45 | 9.59 |
| Area under fruits | ha | 1982–83 | 4,939 | 108,676 |
| Area under Forests | ha | 1982–83 | 444,625 | 2,114,200 |
| Average size of operational holdings | ha | 1976–77 | 1.4 | 1.5 |
| Gross irrigated to net area sown | ha | 1980–81 | 45.23 | 16.47 |
| Livestock population | No. | 1977 | 304,874 (6.36) | 4,795,226 |
| No. of blocks | No. | 1983–84 | 7 | 69 |

*Source*: Statistical Outline of Himachal Pradesh, 1985.

cent tribal concentration and those with dispersed tribal populations and initiation of development efforts, in the first instance, in the former category of area,

— Funds for the tribal sub-plan were allocated from the state's general plan rather than from the funds for welfare of backward classes, as was formerly practised,

— Special financial assistance from the Central government to supplement the state sector sub-plan for the development of tribal areas, and

— Identification of thrust areas for tribal development in the following sectors:
  - infrastructure: minor irrigation facilities, soil and water conservation, cooperation, rural roads, and land reforms,
  - social services: drinking water supplies, general education, technical education, and health, and
  - production: agriculture, animal husbandry, dairy development, fisheries, forests, and small village and cottage industries.

Although only 3.11 per cent of the population lives in tribal areas (Table 26.6) the State plan investment reached the level of 9 per cent during the Seventh Plan (1985–1990) from 3.65 per cent in 1974/75. In order to make working conditions in tribal areas more attractive, a scheme of enhanced compensatory allowances, ranging from 120 to 180 per cent of the total pay, was made available to government employees, and this continues even today. Special winter allowances and housing facilities are also provided. Government officials working in tribal areas are given special financial, technical, and administrative powers so that development activities do not suffer due to bureaucratic procedures. Provisions also exist for the non-diversion of tribal plan budgets and such budgets are not tied to the otherwise prevalent system of fixed expiry dates.

*Backward Areas*

Generally, hill areas have been categorized as underdeveloped, because of the dis-

parity of economic development between them and the lowlands. However, even within these mountains, interregional disparities exist in the overall context of socioeconomic development. For example, in Himachal, the apple belt and off-season vegetable areas can be categorized as affluent by mountain standards, but there are a number of less developed areas that suffer because of either environmental conditions or untapped potentials. These areas are economically marginalized and some people may be living at subsistence level. Such areas were categorized as backward areas, although all the people living there may not be tribals or from underprivileged classes. The following economic indicators were used to identify such areas in Himachal.

(1) Remoteness and inaccessibility.
(2) Demographic indicators: 25 per cent of the population belonged to scheduled castes or tribes, at least 90 per cent of the population engaged in primary occupations, such as agriculture or animal husbandry, and less than 20 per cent of the children between the ages of 6 and 14 years attended school.
(3) Infrastructural indicators: water scarcity in the villages and lack of social and community services such as electricity, health, sanitation, banking, and marketing facilities.
(4) Agricultural indicators: average land holding of one ha or less, of which only 50 per cent was under cash or cereal crops.

Each of the above economic indicators was allotted 25 points. Areas scoring 60 per cent or above were declared backward.

Based on the above criteria, more than 243 village *panchayats* were registered as backward. Ten per cent of the total outlay for education, health, and water supply was spent in these backward areas. Similarly, these criteria were also applied to other selected sectors such as animal husbandry, food and supplies, forests, roads, rural electrification, and small-scale industries.

As a result of concentrated efforts, many villages are now integrated into the mainstream and are developing rapidly.

*The Scheduled Castes*

The underprivileged sections of Himachali society were identified by two important characteristics. They were either geographically isolated (scheduled tribes) or they were culturally marginalized (scheduled castes) from the mainstream. The latter suffered the disabilities of severe economic exploitation and social discrimination. They constituted 22.2 per cent of the total population of the state (Khosla 1985). Keeping in mind these facts, a special component plan for uplifting scheduled castes was formulated. Since then, this component plan has been consistently maintained with sufficient financial resources, for example, the proposed outlay for this component plan in the overall seventh five-year plan was Rs 1,447 million (Anonymous 1984).

The salient features of the new strategy for development in the special component plan included heavy subsidies to these classes for agricultural inputs, rural electrification in such areas as well as in individual houses, subsidized education, monthly stipends, free uniforms, the opening of free coaching centres for admission to technical courses, and free legal aid. Seats are also reserved in professional courses and in the universities. These component schemes have helped the scheduled castes improve their economic conditions and have brought them into the mainstream.

*Tenant Farmers and the Landless*

One of the important causes of low agricultural productivity in Himachal Pradesh was that few of those who actually cultivated the land had any proprietary interests in it. They were either tenants at will or share-croppers only. So reform of the agrarian structure, to protect the marginalized and vulnerable farming communities, was essential for building up an efficient agricultural economy. With strong political will and a sense of equity, the state took bold initiative in implementing land reforms which abolished intermediary tenancy, such as *zamindari*, *jagiris*, and *inams*. Historians and development analysts rate it as a silent revolution. Implemented with sincerity, it helped improve the social and economic position of tenant families. The tenants became the owners of the land they worked. In 1972, a land ceiling was fixed and excess land was distributed among the landless. Final efforts were made to rehabilitate the remainder of the landless poor by settling them on village common lands, which were converted into farmlands for the landless. In addition, incentives based on economic devlopment programmes were initiated for these mountain communities.

As a result of all these measures, the erstwhile depressed farming classes became socioeconomically well off. Today they are a part of the mainstream life of the State, making significant contributions to overall development.

## INACCESSIBILITY AS A TOP PRIORITY OF DEVELOPMENT STRATEGY

Besides sociopolitical efforts to achieve autonomy in development planning and programming, a look at the planning goals and the data on resource allocation for the various plans (Table 26.7) will reveal that there has been definite mountain orientation in the priorities of the five-year plans of Himachal Pradesh. The highest priority was given to transport and communications up to the fourth plan. Once they had reached a satisfactory stage, the highest priority was given to water and power development in the fifth, sixth, and seventh plans. By and large, the second position was given to the agriculture and allied services sector in the various plans of the state. Social and community services were accorded third position in the first three plans and fourth position later on. Industries and minerals ranked fifth in priority.

Economic development in mountainous regions can hardly be visualized without effectively reducing the impact of inaccessibility in mountain areas. Before 1949, when Himachal Pradesh was divided into small feudal states, inaccessibility was the most serious constraint. Pack track and human backs were the only modes of transport. Stray motor roads (the total length in 1949 was 500 km) and bridle paths, usable only in good weather, connected the larger towns and the capitals of some princely states. During winter and the rainy season, many areas remained cut off from the rest of the country for weeks and months as roads were badly damaged due to heavy rains and snow. This isolation and remoteness was the normal way of life, and it delayed the economic growth of the hinterlands. Isolation from urban influence resulted in economic, social, cultural, and political backwardness. Rural populations were not able to take advantage of the opportunities offered by natural resources. The potentials of cash crops, such as fruits and vegetables, for which ideal ecological conditions existed, could not be harnessed as these were not remunerative due to the exorbitant cost and difficulty of transport. At that time, the means of transport in larger interior areas were mules, sheep, and

**Table 26.7. Percentage allocation of expenditure of different sectors in the five-year plans of Himachal Pradesh**

(Percentage)

| Percentage annual Sector | First Plan 1951-56 | Second Plan 1956-61 | Third Plan 1961-66 | Annual Plans 1966-69 | Fourth Plan 1969-74 | Fifth Plan 1974-78 | Annual Plans 1978-80 | Sixth Plan 1980-85 | Seventh Plan Targets 1985-90 | Growth of Expenditure 1951 -66 | 1966 -85 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Agriculture and allied services | 14.1 | 15.7 | 22.7 | 18.6 | 24.1 | 26.2 | 26.6 | 25.1 | 28.97 | 62 | 113 |
| 2. Cooperation | 14.1 | 14.9 | 10.3 | 4.5 | 3.2 | 1.1 | 1.7 | 1.1 | 0.77 | 25 | 6 |
| 3. Water and power development | 4.1 | 9.4 | 7.1 | 27.9 | 21.7 | 26.7 | 22.2 | 26.2 | 37.41 | 67 | 392 |
| 4. Industries and minerals | 1.7 | 2.5 | 2.5 | 3.2 | 3.6 | 3.3 | 3.0 | 3.2 | 2.92 | 56 | 132 |
| 5. Transport and communications | 46.2 | 37.1 | 35.2 | 34.0 | 29.1 | 24.1 | 22.9 | 17.7 | 18.13 | 26 | 48 |
| 6. Social and community services | 19.8 | 19.2 | 21.2 | 11.5 | 18.0 | 16.3 | 21.3 | 24.2 | 10.25 | 39 | 117 |
| 7. Economic and general services | 0.1 | 1.2 | 1.0 | 0.3 | 0.3 | 2.3 | 2.3 | 2.5 | 1.55 | 666 | 270 |
| Total Rs million | 100.0 (52.7) | 100.0 (160.3) | 100.0 (338.4) | 100.0 (397.8) | 100.0 (1,134.3) | 100.0 (1,614.8) | 100.0 (1,475.6) | 100.0 (6,556.6) | 100.0 (9,070.0) | 42 | 97 |

*Source*: Draft Seventh Plan, 1985–1990, Shimla: Planning Department, Government of Himachal Pradesh, 1984.

goats. Thus, in its overall development strategies, Himachal gave top priority to transport and communications in the initial development phases (1954–1974). Road development throughout the state received a great deal of attention during the first four five-year plans (Table 26.7). From the inception of the first five-year plan, about 25 to 40 per cent of the total state expenditure was incurred annually on the construction and improvement of roads. Road development across the Himalayan ranges, connecting most of the remote mountain areas of the State, was further facilitated by the national focus on good road networks in the mountains, as a result of the India-China War in 1962. Himachal benefited from two national highways passing through its most remote, high mountain areas, and these have been built without direct costs to the State. Thus, its resources were invested in building locally important state and district roads. Today, the State maintains four categories of road:

(1) primary roads which provide inter-district and inter-state connections such as national and state highways,
(2) secondary roads which connect district towns with their sub-divisions, generally called district roads,
(3) tertiary roads connecting towns with the villages to facilitate the movement of goods and human transport; having fulfilled requirements under (1) and (2) above, village roads are currently receiving attention in all agro-ecological zones of the State, and
(4) quarternary roads; wherever village roads in category (3) have not been provided villages are linked to motorable roads by mule tracks and bridle paths.

Except for one or two cases there is no area of Himachal Pradesh which cannot be reached from the motor road by a few hours' walk. The network of roads grew from 500 km in 1949 to 16,589 km in 1980 and 21,585 km in 1989. Further, to improve transport facilities, the unsatisfactory private transport system was abandoned, because it was poorly managed, insufficient, and ill-suited to hill roads. Transport services were thus nationalized and State transport facilities extended to all possible motorable roads.

The efforts made by Himachal Pradesh to build a network of roads throughout the State, especially in remote rural areas, have facilitated development activities in all key sectors. The barriers of isolation and remoteness have been broken down, adding to the attractiveness of rural life. This has a positive influence on net domestic output and agricultural production, because transportation of both people and goods has been facilitated and the expansion of rural settlements and the functional growth of towns and service centres have been promoted with a consequential increase in the area of influence of urban centres. Easier accessibility has provided vital linkages between producing and consuming centres and also facilitated the provision of jobs to landless labourers and marginal farmers. Seasonal migration from high altitude areas has decreased. The boost given to the tourism industry has grown into an important income-generating activity. Immediately after Independence, there were hardly any manufacturing units in the State, but progress was made, especially in the small-scale cottage industry sector, following the creation of transport facilities.

By reducing inaccessibility, the process of agricultural transformation from traditional cereal crops to commercial cash crops, such as off-season vegetables and fruits, has taken place. It has remarkably improved the socioeconomic status of farmers. The road network not only solved the problem of marketing agricultural produce but it also facilitated the

availability and distribution of essential agricultural inputs and the introduction of new farm technologies in rural areas. Even the remote villages now have direct access to markets in the major cosmopolitan cities of India for marketing their agricultural and horticultural produce, e.g., apples and potatoes. Some of these items are being exported to neighbouring countries.

Access has also helped strengthen the animal husbandry sector. There are extensive networks of milk producers' cooperatives and milk chilling plants which collect milk from accessible rural areas and supply milk to almost all the towns in the State. The increased efficiency of transportation has decreased the cost of cultivation, brought down the prices of all commodities, and reduced the pressure on land because of shift from agricultural to non-agricultural enterprises. Thus, reduced inaccessibility has helped to solve economic under-development to a great extent.

On the more fragile, steep mountain slopes, the state has plans to install cableways or ropeways as an alternative means of reaching remote villages. An allocation of Rs 100 million was made for cableways and ropeways in the 7th five-year plan.

## AGRICULTURAL DEVELOPMENT STRATEGY

As in any other mountain area, agriculture is the major occupation of the people of Himachal Pradesh. It provides employment to about 71 per cent of the total working population. Farmers do not have large land holdings and in fact small and marginal farmers, with less than 3 ha of land, constitute the majority of the farming class (Table 26.3). Even the per capita availability of arable land (0.14 ha) is an indicator of the predominance of small and marginal farmers.

Such conditions can be observed throughout these mountain areas. What is noteworthy in the case of Himachal is the positive approach to the transformation of subsistence systems into economically promising commercial agricultural systems. In two decades agriculture has been commercialized to the extent of bringing in an annual revenue of Rs 600–700 million (US$ 32–37 million) to mountain farming communities.

### Harnessing Diversity for Agricultural Development

Resource use and production in the agricultural sector (which for the purposes of our discussion includes crops, horticulture, livestock, pastures, and forestry) is largely influenced by the geographical and environmental diversity prevailing in different areas (Joshi 1984). The wide range of altitudes and variations in other agro-climatic parameters, such as rainfall and temperature, broadly classify Himachal into four major agro-climatic zones. In the following discussion it will be shown how biophysical diversity was harnessed to bring improvements to the agricultural systems. In planning the cultivation of cash crops, the comparative advantages of the mountain climate and the crops that had better scope for exchange and marketing in the hinterlands were taken into consideration.

Below are zone-specific descriptions of the resource base and mountain specificities of the different zones explaining the modifications and adaptations made to change the existing constraints to potential benefits.

### The Low Hills and Valleys Near the Plains

This area has a sub-tropical climate. It rises up to an elevation of 900 m and receives an approximate rainfall of between 600 and 1,000 mm. The districts of Una, Hamirpur, Bilaspur, and parts of Kangra and Solan fall into this zone, which occupies about 35 per cent of the geographical area and 33 per cent of the cultivated area of Himachal Pradesh. It has a high population density of 234 persons per $km^2$ compared to the State average of 77 persons per $km^2$. Crops usually face moisture stress outside the monsoon season. Irrigation is practised by means of wells, tubewells, ponds, lakes, and traditional irrigation channels. Agriculture is dominated by annual crops, mostly foodgrains. Due to the heavy population and livestock pressure, forests and grazing lands have been drastically reduced to provide more agricultural land. Over the years, the livestock pattern has demonstrated a gradual predominance of buffaloes over all other stock.
The agricultural development strategy of this zone is based on:

(1) promotion of food crops in the fertile valleys,
(2) improvements in livestock quality and reduction in the number of small and marginal farmers depending on milch cattle to supplement their farm income through selling milk,
(3) industrial development as a source of employment to remove pressure from agricultural lands, and
(4) horticulture, i.e., fruit crops, promoted on a secondary level on less fertile and slopy lands.

### The Middle Hills and Valleys with Sub-humid Climates

This zone consists of areas of the Lesser Himalayas, lying between 600 m and 1,800 m. It covers the districts of Sirmour, Solan, Mandi, and parts of Chamba. Precipitation is between 1,500 and 3,000 mm, 70 per cent of which is received during the monsoons. The zone occupies about 32 per cent of the geographical area and 53 per cent of the cultivated area of the State. The population density is 143 persons per $km^2$. Small valleys with good irrigation facilities are found along the banks of streams and rivulets. A major portion of the uncultivated area is composed of grasslands. Forests are limited to the northern and northeastern slopes only. The zone is a producer of grain crops, off-season vegetables, and stone fruits. Livestock husbandry is an integral part of the farming system. Both buffaloes and cattle are kept. Forests and pastures are under pressure from both agricultural expansion and from the livestock population.

Agricultural development was earlier concentrated on food crops, livestock, and stone fruits. In recent years, the zone emerged as the vegetable bulwark of the State. The demand for vegetables in the adjacent plains (in the cities of the Punjab and in Delhi) and an appropriate cool climate for cultivating vegetables when they are out of season in the plains has given rise to the phenomenon of off-season vegetable cultivation.

Himachal is now being identified as the 'vegetable state' (Singh 1989). Cabbages, cauliflowers, peas, hill capsicum, tomatoes, and beans are produced during periods when they cannot be grown in the adjoining plains, and they are in great demand. For this reason, hill vegetables fetch higher prices and are sold at a premium. A favourable

climate and easy accessibility to developed markets in the neighbouring states are the main reason for such a spectacular success.

Earlier, off-season vegetable growing was not at all a common practice, despite the fact that the State had vast potential for the production of off-season vegetables on a commercial scale. This was because of the non-availability of critical inputs, unawareness among the farmers, lack of irrigation and marketing facilities, and the non-availability of disease-free, high-yielding germplasm. In view of the economic potential of vegetable cultivation (after the inception of the State) several Vegetable Research and Extension Farms were established in four of the different agro-climatic zones. Following the founding of a university of horticulture and forestry, off-season vegetables received a lot of attention in both research and extension activities.

As a result of these efforts, marginal farmers are bringing more areas under these crops because the per hectare net returns from off-season vegetables are certainly higher than the returns for cereal crops. If apples helped boost the economies of families with relatively large, slopy, marginal land holdings in the mountain zone, then vegetable cultivation has been equally successful in improving the economies of small and marginal farmers who have sufficent family labour and land holdings. Vegetable production is also a source of income for people not involved in horticultural development, whether within or outside the horticultural zone (Tewari 1990).

### Complementary Diversification Efforts

Beekeeping and mushroom cultivation are activities with comparative advantages in mountain agriculture. They do not need large areas of land, and beekeeping provides essential ecological services such as the cross-pollination of crops. Agricultural strategies in Himachal Pradesh incorporated these diversified activities into mountain agricultural development programmes. Although they are not zone-specific, the climate in this zone is especially suitable for them.

Beekeeping has traditionally been an economically marginal farming occupation, because it is a low investment activity unless operated on a commercial scale. In addition, it is flexible enough to adapt to any scale of operation, and, hence, ideally suited for small farmers. Inaccessibility plays a less constraining role because hive products are characterized by low weight, high value, non-perishability, high storage capacity, and easy transportation. Further, the role of honeybees as pollinators assumed priority in horticultural development strategies. The government maintains a substantial number of bee colonies which are distributed to orchardists during the apple flowering season to enhance productivity.

### High Mountains and Valleys with a Temperate Climate

This area includes the districts of Kullu, Shimla, and parts of Mandi, Chamba, and Kinnaur. Characterized by a humid temperate climate and alpine pastures, the zone commences at an elevation of 1,600 m. It contains 25 per cent of the geographical area and 11 per cent of the cultivated area of the state. The population density is only 63 persons per $km^2$. The annual precipitation varies from 1,000 mm to 1,500 mm, 60 per cent of which is received during the monsoon season. Most of the cultivated areas are located in the

higher reaches where there is a lack of irrigation facilities. On a limited scale, perennial streams and springs are used for irrigation, and the zone is a major producer of temperate fruits such as apples, pears, plums, and off-season vegetables. Most of the valuable timber forests are also located here. Thus, it also benefits from forest resources, both major and minor, to a considerable degree. Crops include a mixture of the major food crops, wheat and maize, as well as mountain crops. Cattle, sheep, and goats are kept. Due to the favourable climate, tourism also flourishes. The major resorts are Shimla, Kullu, Manali, and Dalhousie in Chamba. Currently, because of the abundance of resources, moderate population pressure, and appropriate development initiatives, the zone has experienced considerable prosperity. The extent of human migration, both inter-state and intra-State, as well as seasonal and permanent, is greater in this zone.

The agricultural development strategy for the zone focussed on the promotion of fruit cultivation (Azad et al. 1987) because of the suitability of the climate for apples and other pome fruits. Most of the horticultural development efforts of the State have been concentrated here. In addition to some agricultural land, the approach has been to convert slopy non-agricultural land which was suitable for crop cultivation into fruit orchards (Table 26.8).

**Table 26.8. Land-use shifts occurring because of horticultural development in Himachal**

| Category | Land-use pattern before orchards | | | Existing land-use Pattern | | | Previous use of orchard land | | Shift of area to orchards from | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Land holding (ha) | Area under field crops | Area put to other uses | Area under field crops | Area under orchards | Area under other uses | Field crops (ha) | Barren and other land (ha) | Field crops (Col. 8 as % of Col. 3) | Barren and other (Col. 9 as % of Col. 4) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | | | | | *Temperate zone* (Prome fruits) | | | | | |
| Marginal | 0.71 | 84.4 | 15.6 | 52.2 | 44.3 | 3.6 | 0.225 | 0.084 | 38.2 | 77.2 |
| Small | 1.142 | 79.0 | 21.0 | 52.8 | 39.7 | 7.5 | 0.365 | 0.192 | 33.1 | 64.2 |
| Medium | 2.34 | 79.9 | 20.1 | 51.2 | 37.9 | 10.9 | 0.689 | 0.216 | 35.9 | 45.8 |
| Large | 5.81 | 61.3 | 38.7 | 33.6 | 41.7 | 24.7 | 1.619 | 0.816 | 45.2 | 36.2 |
| Overall | 2.57 | 69.6 | 30.4 | 41.6 | 40.7 | 17.7 | 0.721 | 0.327 | 40.3 | 41.8 |
| | | | | | *Sub-tropical zone* (Stone fruits) | | | | | |
| Marginal | 0.66 | 86.0 | 14.0 | 65.2 | 28.4 | 6.4 | 0.138 | 0.051 | 24.2 | 54.3 |
| Small | 1.54 | 86.2 | 13.8 | 72.9 | 18.3 | 8.8 | 0.204 | 0.045 | 15.4 | 36.3 |
| Medium | 2.46 | 81.7 | 18.3 | 69.7 | 16.4 | 13.9 | 0.295 | 0.108 | 14.7 | 23.9 |
| Large | 2.58 | 53.8 | 46.2 | 46.7 | 8.7 | 44.6 | 0.517 | 0.108 | 13.0 | 3.1 |
| Overall | 3.01 | 65.4 | 34.6 | 55.9 | 12.4 | 31.7 | 0.288 | 0.086 | 14.7 | 8.2 |
| | | | | | *Himachal Pradesh* | | | | | |
| Marginal | 0.68 | 85.2 | 14.8 | 58.6 | 36.5 | 4.5 | 0.182 | 0.067 | 31.2 | 66.7 |
| Small | 1.48 | 82.7 | 17.3 | 63.2 | 28.6 | 8.2 | 0.288 | 0.135 | 23.5 | 52.7 |
| Medium | 0.24 | 80.8 | 19.2 | 60.7 | 26.3 | 12.5 | 0.482 | 0.184 | 24.8 | 35.2 |
| Large | 6.61 | 57.2 | 42.8 | 41.0 | 23.1 | 35.9 | 1.067 | 0.461 | 28.3 | 16.3 |
| Overall | 2.79 | 67.3 | 32.7 | 49.2 | 25.5 | 25.3 | 0.505 | 0.206 | 26.8 | 22.6 |

Note: Figures in Col. 3 to Col. 7 are percentage of total land holding (Col. 2).

*Source*: K.C. Azad, et al., *Horticultural Development in Hilly Areas*, Table 4.10. Delhi: Mittal Publication, 1987.

The horticultural development strategy of the state has brought about a number of

positive changes in the form of increases in the incomes of the hill farmers, better use of land that is otherwise not suitable for agriculture, the checking of soil erosion on hill slopes, and the development of horticulture-based industries (Nadda 1988, Azad et al. 1987, Swarup 1990). Marketing, transportation, and the provision of cold storage are handled by the Horticultural Products Marketing Corporation, a specialized (state sector) agency established for this purpose (Rana 1990).

Before the formation of Himachal Pradesh in 1948, hardly 1,000 ha of land was under fruit tree cultivation. The area increased to 44,329 ha in 1970/71, and 149,284 ha in 1988/89. The total fruit production was 1,485,800 MT in 1970/71 and it increased to 3,086,900 MT in 1988/89. Apples are the principal crop and they account for more than 80 per cent of the total fruit production. In 1987, apple exports from the State amounted to 207,421 MT (Anonymous 1989). The priority given to horticultural development can be assessed from the five-year plan outlays for this sector (Table 26.7). While the total outlay for horticulture in the sixth plan (1980–1985) was Rs 115 million, it more than doubled (284.3 millions) during the seventh plan (1985–90). As a consequence of horticultural development, the economic status of farmers from this zone is much better than in other zones (Bhati et al. 1990).

Further, horticulture flourishes in the State because of the unlimited demands for these products in the adjoining lowlands. The large towns and cities of northern India provide a huge market with favourable terms of trade.

Besides fruits, medicinal plants, mushrooms, and other non-wood forest products contribute substantially to the economy of this zone. It is rich in forest resources and has an optimum population. Under the changing trends of horticulture-dominated farming, livestock composition patterns are also changing slowly. Rabbits for wool, Jersey cows to meet milk needs, and some fine quality sheep for wool are replacing conventional livestock in apple growing areas. This is partly as a response to declining common lands and partly because of the growing scarcity of cheap human labour in this zone. Within the transformed economy, these activities are held to be less productive and not very promising economically.

### Trans-Himalayan Cold Dry Zone

This area includes the high mountain areas of Kinnaur and the Pangi areas of Chamba and Lahaul-Spiti. Elevations range from 2,000 to 3,500 m. It occupies about 8 per cent of the geographical area and 3 per cent of the cultivated area of the State. The population density ranges from nine persons per $km^2$ in Kinnaur and Pangi to two persons per $km^2$ in the Spiti area. Precipitation is less than 200 mm during summer but heavy precipitation occurs in the form of snow during winter. The dry temperate climate has resulted in scanty vegetation. Cultivation is wholly dependent on irrigation, provided by harnessing perennial streams and springs. Soils are prone to heavy erosion from glaciers and avalanches. Man-made vegetation belts are developed on water courses for use as fuel and fodder. Agriculture is concentrated on food crops such as barley, buckwheat, wheat, and maize. During the last decade, a great deal of effort has been made to transform farming in this zone. The production of potato seeds, chicory, hops, and vegetable seeds was promoted on a large scale for cash crop farming. Medicinal plants, as cash crops, are also produced in parts of the zone. A decade ago, there was hunger in this zone

but great strides have been made through the commercialization of agriculture and the transformation of the farming economy. Cold desert improvement programmes, focussing on afforestation and soil conservation, have proved beneficial in terms of both farming needs and environmental conservation.

The agricultural development strategy for this zone focussed on the following aspects.

(1) Taking advantage of road development, the potential of the niche of the cold, dry climate was used through promotion of disease-free potato seed cultivation on a large scale. The Northeastern Himalayan areas, which were earlier source areas for potato seed, had been hit by an epidemic of potato disease. Thus, to fulfill the demands for potato seeds from many Indian States in the plains this zone was chosen as the most suitable area. Backed by ensured demand and favourable terms of trade, this zone became an agricultural area of great potential within two decades. Today, apart from apples, seed potato is another major product of Himachal Pradesh. Potato production has nearly quadrupled in the last 35 years. Although the crop is grown in all districts, this area is the major producer. Potato seed export brings in about Rs 10 crore (US$ 5.4 million) annually.

(2) Apart from the commercial cropping strategy, special efforts have been made through an anti-desertification programme to improve the well-being of both people and the environment.

*The Anti-desertification Programme*

This programme, funded by the central government, is based on the recommendations of the National Commission on Agriculture concerning the development of the desert areas of Lahaul and Spiti. The programme emphasizes irrigation, afforestation, community plantation, fodder development, soil conservation, crop farming, animal husbandry, and fisheries and is independent of the above-mentioned special tribal development programmes.

The major achievements (Negi 1985) so far include the development of irrigation facilities—for both agriculture and afforestation purposes through a network of channels—from melting glaciers, lift irrigation schemes, and the construction of water storage tanks. However, such irrigation schemes in this cold desert area are facing the problems of damages caused by snow and avalanches, high costs, non-availability of repairing facilities, short working seasons, and labour shortages. Keeping these problems in mind alternative irrigation methods are being recommended. These include the use of windmills, hydraulic dams, collapsible pipes, drip irrigation, and lift irrigation.

Under the anti-desertification project, the afforestation, agroforestry, and agricultural sectors are being given top priority. In agriculture the major emphasis is on the diversification of crops. Earlier, barley was the major staple crop. Now wheat, potatoes, peas, mustard, onions, beans, cabbages, and tomatoes are successfully grown up to an altitude of 3,810 masl. Farmers receive subsidized agricultural inputs such as improved seeds, fertilizers, and agricultural implements. There are also incentives for bringing barren lands under cultivation.

Under this project, improved livestock such as yaks from Ladakh, Jersey cows, crossbred Merino sheep, and Angora goats are distributed to the farmers on a subsidized basis. A network of veterinary dispensaries and an increase in the number of fodder trees and fodder grasses help promote livestock production.

The trans-Himalayan cold dry zone provides an ideal 'niche' for harnessing non-conventional sources of energy such as the sun and wind. For example, weather data from the cold desert of the Spiti Valley reveal that there are as many as 306 dry, clear days in a year when solar energy can be harnessed. In this context, some photovoltaic lighting systems have already been installed in public places. Solar photovoltaic pumps are used to dry fruit, vegetables, and seeds. Similarly, wind (velocity of 45 km/hour) is also harnessed by installing aero-generators and windmills; water is drawn from the rivers and tributaries for power generation.

The impact of these efforts has resulted in 50 per cent of the 11,815 target group families moving above the officially defined poverty line by the end of seventh plan period (1985–1990). All the villages in the tribal areas receive electricity and are provided with piped drinking water. The literacy rate is now approximately 50 per cent, compared to 42 per cent in the State as a whole. The increases in apple production in Kinnaur District and in potato seed cultivation in Lahaul-Spiti District have changed the subsistence economy into a commercial one (DES, GOHP 1989).

The multi-pronged strategy to develop this underprivileged, resource-scarce zone had a definite impact. Potatoes, hops, and other cash crops, together with several socioeconomic incentives made available through the special tribal development programmes, have brought comparable affluence to mountain farming families. Today, by and large, people from this zone are considered to be better off than people from the first two zones in education, employment, and in living standards.

*Livestock*

Almost 90 per cent of farming families maintain bovines. Animal husbandry is in fact an integral part of the farming system and provides manure, draft power, milk, wool, and meat. The state has a livestock population of 5 million including cattle, buffaloes, sheep, goats, horses, and yaks at an average density of 99 livestock units per $km^2$. Improvements in the quality of cattle were undertaken to facilitate promotion of a network of dairy development programmes and provide cash income to families having little agricultural land and few alternative sources of income.

The contribution of animal husbandry to State income is 12 per cent in Himachal Pradesh as compared to a national average of 6 per cent. This signifies the importance of livestock in the State's agricultural systems. In view of this, livestock received appreciable attention in the development planning process. The principal livestock development programmes include: (1) animal health and disease control through a network of 216 veterinary hospitals and more than 500 dispensaries, (2) cattle development through key village schemes, hill cattle development programmes, and intensive cattle development projects and breeding facilities through hospitals, dispensaries, bull centres, and artificial insemination centres, (3) sheep-breeding and the production of wool through breeding farms, (4) poultry development, (5) feed and fodder development schemes, (6) development of dairy and milk supply schemes, and (7) a special component plan for animal husbandry for economically marginal farmers from tribal areas or from scheduled castes or scheduled tribes (Negi 1990). As a result of such programmes, there is now great diversity in the livestock resources and products in the State. Cattle, buffaloes, yaks, sheep, goats, poultry, and rabbits are the major types of livestock reared. These animals provide milk, mutton, wool, hides, motive power, transport, and manure. The projected target is

that each person in the State will have access to 300 gm of milk, 100 gm of meat, and an egg a day (Negi 1990) in the near future.

## HARNESSING MOUNTAIN 'NICHE'

### Water Resources

Water resources occupy a vital position among the natural resources of Himachal Pradesh. The hill topography, the steep fall of rivers down the slopes into mountain catchments, and the perennial water supplies from the streams favour the development of hydroelectricity in the State (Joshi 1984). The five major river systems originating from the Western Himalayas, namely, the Chenab, Ravi, Beas, Sutlej, and Yamuna, pass through Himachal Pradesh. A conservative estimate of the total hydropower potential of Himachal Pradesh comes to 20,000 MW or even more. Out of this, 12,700 MW can be generated from the five river basins cited above (Anonymous 1985). From the Sixth Five-year Plan onwards, exploitation of the hydroelectric power potential in the State has received top priority. The installed capacity of hydropower has increased 75 times since 1950/51, and 3,286 MW have already been harnessed out of a total potential of 12,700 MW. More hydel projects with power potentials of 126.52 MW have been completed while others are under way (DES, GOHP 1989).

There are a number of benefits from hydropower to the state. Electricity for household consumption relieves the pressure on fuelwood and kerosene. The establishment of industrialization based on a renewable energy source is possible and industrial houses and entrepreneurs are drawn to Himachal Pradesh because of the uninterrupted electricity supply. This is a significant advantage to industrialists because of the general shortage of electricity in the adjoining states. Selling the excess electricity to adjoining states brings in huge revenues. It is this latter benefit that planners are most interested in. Harnessing the water resources' 'niche' helps the State generate more revenue so that it can invest in development to further improve the quality of social services. Fortunately for Himachal Pradesh, there is a prevailing power shortage throughout the whole northern region of India. This affects industries, agriculture, and the overall economy. However, as small hill state such as Himachal Pradesh may not be able to provide the outlay for big hydro-projects from its own yearly or five-year plan budgets, alternative arrangements for financial support from the Government of India and from neighbouring states have been made. A plan to exploit an additional 4,700 MW at a cost of Rs 50,000 million has been formulated for the coming decade.

The visible impacts of hydropower development are that several industrial complexes have been established in the State, and electricity is provided in all of its rural areas. Pressure on the forests, as a source of fuelwood, is decreasing and people are finding electricity an ideal substitute for wood. This enables the State government to implement other schemes such as water supply schemes and lift irrigation schemes. With the completion of major hydel projects, electricity is becoming a major source of income.

### Tourism

Tourism is one of the few off-farm employment activities of the State. The major fo-

cus of tourism development has been on harnessing the scenic, cultural, and recreational resources. While the state has been looking after the promotional aspects, people have benefited from the increased employment opportunities in off-farm professions such as hotel management and private transport services. Taxi services and private hotels have become a big business. To help unemployed, educated youths to enter into these professions, very attractive financial policies have been adopted by the State.

## INDUSTRIAL DEVELOPMENT AS A TERTIARY SECTOR FOR REDUCING PRESSURE ON LAND

To reduce the pressure on land, it was essential to develop the potentials of the industrial sector (especially small and cottage-scale industries). In the late 1960s, manufacturing in Himachal Pradesh was still in the cottage industry stage. Since then, the creation of infrastructural facilities and an aggressive government policy of incentives and subsidies have resulted in the emergence of a relatively sophisticated industrial framework. A large number of industrial firms, 97 in the large and medium-scale sector and about 6,400 in the small-scale sector, employ about a hundred thousand workers. However, it is in the cottage industry sector, with more than 60,000 units, that employment has been impressive. The State produces diverse goods such as cement, engineering products, electronic goods, watches, and fertilizers.

In terms of resource allocation, licensing and the provision of materials the industrial development strategy of the State has the following priorities.

(1) Industries that produce items having considerable value added (top priority).
(2) Units based mainly on local resources (top priority).
(3) Units catering mainly to local requirements.
(4) Units based on scarce and controlled raw materials and competitive with outside units.
(5) Industries based on outside resources and demand.

Categories (4) and (5) receive the lowest priority under the industrial policy, because the approach is to discourage such industries in the State.

Thus, the industrial development policy aims at ensuring the optimum utilization of local, raw materials and stimulating employment. Industries with greater employment potential and labour intensive units are accorded preferential treatment. Emphasis on the growth of small-scale industries is in tune with mountain perspectives and specificities, as these have the comparative advantages of low investment, high potential for employment generation, and easy dispersal, especially in rural and semi-urban areas.

A future approach for the expansion of industrial development has already been identified.

- Plentiful natural resources, especially hydroelectricity, ensuring cheap and sufficient power.
- Cool environment, suitable for engineering precision and electronic industries.
- Major and minor forest products which provide raw materials.
- Large mineral deposits, especially limestone.
- Development of horticulture, providing raw materials for agro-based industries.
- Political stability and a peaceful environment.

## DIMENSIONS OF FRAGILITY AND APPROACHES

The pressure on mountain ecosystems arises from *natural catastrophies* as well as from the high use intensity of natural resources. The former include snowstorms, cloud bursts, avalanches, forest fires, and landslides. They cause disruption in communications and the loss of life and property. Their sudden impact on large volumes of stored water is often disastrous. Like other mountain regions of the world, Himachal Pradesh is subject to natural hazards that are often outside the direct control of man.

Pressures also arise from *man-made catastrophies*. Mountain resources decrease and deteriorate because of population pressure, expanding industrialization and urbanization, and the emergence of new needs connected with the development of communications and trade. The population growth is 2.3 per cent per year in Himachal Pradesh, and this provides a serious set-back to economic growth, which is 2.4 per cent per year. It also places enormous pressure on natural resources. Similarly, forests, pastures, medicinal plants, and wildlife are important natural resources and fall under the fragile resources category for development activities.

The salient features of land use in Himachal Pradesh include a low percentage of areas suitable for agriculture, intensive land cultivation beyond its carrying capacity, low percentage of areas lying fallow, extension of cultivation to marginal and sub-marginal land, and a high percentage of areas under village pastures and grazing lands. Similarly, forest and grassland ecosystems are becoming more fragile, as a result of destruction of the natural habitat, overexploitation, and degradation caused by grazing beyond the carrying capacity and encroachment on forest and grassland areas for the cultivation of agricultural and horticultural crops. Harmful exploitation of economically important plant and animal species and the practice of monoculture are having serious ecological consequences. As the management of fragile environments was considered to be primarily related to forests, related approaches and programmes have been launched under the forestry programme.

A comprehensive State policy to manage the fragile mountain environment was formulated in 1980. Its major goals are:

(1) to cover 50 per cent of the total geographic area with forests by 2000 A.D., to minimize the diversion of forest areas into other farming sectors such as agriculture or horticulture,
(2) to raise multiple-use tree species to meet requirements for timber, fuel, fodder, and manure as well as soil and water conservation needs,
(3) to create biosphere reserves,
(4) to control grazing,
(5) to develop suitable substitutes for wooden fruit-packing cases, and
(6) to reduce annual tree felling by 10 per cent.

As a result of the implementation of this plan, the prescribed annual extraction of wood decreased from 628,000 $m^3$ to 407,000 $m^3$ in 1984. The felling of trees for commercial purposes has gradually decreased. The system of contracting out timber extraction work to private contractors was abolished. Now, the State forest corporation plans commercial timber extraction on the basis of the productivity potentials of a forest area. A substantial increase in resource allocation for afforestation and soil conservation activities during the 1980s is now producing encouraging results (Table 26.9).

**Table 26.9. Changes in land use in Himachal Pradesh from 1970/71 to 1985/86**

| Land use | 1970/71 | | 1985/86 | | % Change from 1970/71 to 1985/86 |
|---|---|---|---|---|---|
| | Area ('000 ha) | Percent to total | Area ('000 ha) | Percent to total | |
| Total geographic area: | | | | | |
| a) By professional survey | 5,565.8 | | 5,567.3 | | 0.03 |
| b) Reporting area for land use purposes | 2,932.5 | 100 | 3,227.1 | 100 | 10.05 |
| Forests | 638.2 | 21.8 | 884.8 | 27.4 | 38.64 |
| Barren and uncultivable | 118.8 | 4.0 | 159.6 | 7.0 | 34.34 |
| Land put to non-agricultural uses | 172.1 | 5.9 | 220.1 | 6.8 | 28.89 |
| Cultivable waste | 167.7 | 5.7 | 128.0 | 4.0 | −23.67 |
| Permanent pastures and other grazing lands | 1,188.0 | 40.5 | 1,153.63 | 5.7 | −2.90 |
| Land under misc. tree crops not included in area sown | 40.8 | 1.4 | 40.8 | 1.4 | 0.00 |
| Current fallows | 58.3 | 2.1 | 43.9 | 1.8 | −4.95 |
| Other fallow land | 2.3 | | 13.7 | | |
| Net area sown | 546.4 | 18.6 | 582.6 | 18.1 | 6.63 |
| (Cropping intensity) | (166.9) | — | (167.1) | — | (0.12) |

*Source*: Directorate of Land Records, Himachal Pradesh, Shimla.

## CONCLUSIONS

In terms of both (1) conventional yardsticks, e.g., productivity and income growth, infrastructural facilities, and modern input use, and (2) quality of life indicators such as reduced landlessness, education, housing, health, and nutrition, Himachal Pradesh is a success story in area-based development. The rapid transformation of Himachal Pradesh could be attributed to several factors and could be explained in terms of the sensitivity of its development interventions to different mountain specificities. The replicability and applicability of these development interventions to other mountain environments will vary according to the prevailing conditions of the environments in question.

Himachal passed through a major political and socioeconomic transformation process within a period of four decades. The State has been instrumental in removing interregional disparities within its jurisdiction. This has been achieved through a specified strategy for the socioeconomic development of underprivileged classes. In its plans there has been an emphasis on infrastructure, social services, and production through liberal economic assistance and subsidies. As a result of such efforts, marginalized classes have joined the mainstream. Agricultural development was planned according to agro-ecological zones, emphasizing different lead farming activities in each zone. It was a strategy for harnessing the environmental diversity of the State, and its success transformed the subsistence farm economy in a most promising way.

Further, Himachal's success primarily lay in the ability of its planners to consider mountain specificities in development approaches (Table 26.10). It identified and har-

nessed the variety of 'niche' it had. Horticulture was accepted as a lead sector in its development strategy. Political will and the people's traditional experiences played an important role in promoting this land-extensive activity, even on fragile slopes. Concomitant, and in some cases sequential, emphasis on related activities, such as animal husbandry, beekeeping, and vegetable crops, with R&D and marketing support, played an important role in Himachals transformation. Simultaneous attention to the production and marketing aspects also led to an improvement in and utilization of infrastructural facilities. The availability of an extensive hinterland, i.e., the non-mountain areas of India, to absorb the products, e.g., fruits, for which Himachal has a comparative advantage, not only encouraged their production but also facilitated the harnessing of other major 'niche' (the irrigation and hydropower potential) by the State without having to bear the huge overhead costs involved in the process. The states that were potential users of irrigation and power provided the investments for their development. After Himachal became a full-fledged state of India, it was in a better position to promote these projects.

**Table 26.10. Consideration/incorporation of mountain perspective in public policies and programmes in selected areas of HKH region**

| Levels of consideration/ incorporation of mountain specificities in public policies and programmes | West Sichuan | Himachal Pradesh | Nepal | Pakistan NWFP |
|---|---|---|---|---|
| 1. Understanding of broad ecological zonation | * | * | * | * |
| 2. Presence of (1) at micro-level | P | * | P | P |
| 3. Macro-level policies and planning based on (1) and (2) | P | * | P | P |
| 4. Micro-level projects and resource allocation based on (1), (2) and (3) | | | | |
| a. Wider coverage | x | x | x | x |
| b. Limited coverage | * | * | * | * |
| 5. Farm-level initiatives | P | P | P | P |
| 6. Implementing agencies perspectives | P | P | P | P |
| 7. Consideration of mountain specificities as explicit constraints | P | * | * | P |
| 8. Persistent information gap | | | | |
| a. Macro-level | P | P | P | P |
| b. Farm-level | * | * | * | * |

Note: * = yes; x = no; P = partial or limited.

*Source*: MFS-ICIMOD, August, 1990. *Progress Report of the Project on Strategies for Sustainable Mountain Agriculture.*

Efforts made by Himachal Pradesh to remove the constraints caused by inaccessibility, by building a road network throughout the State, especially in remote rural areas, have facilitated development activities in all sectors. Roads have broken the barriers of isolation and remoteness and added attractiveness to rural life, promoting the expansion of rural settlements and the functional growth of towns and service centres with an increase in the area of influence of urban centres. By reducing inaccessibility, the process

of agricultural transformation, from traditional cereal crops to commercial cash crops was expedited and resulted in remarkable improvements in the socioeconomic status of the farmers in the state.

Regarding the explicit or implicit consideration of mountain specificities, such as diversity 'niche', marginality, and adaptation mechanisms, Himachal provides us with a number of useful lessons for other mountain areas to follow. However, since the extensive hinterland played an important facilitative role in the harnessing of 'niche', Himachal's experience may not be applicable to mountain areas having limited linkages with the plains. Nevertheless, the State's integrated approach (which takes into consideration the potential of specific ecological zones), evident in the synchronization of various related activities, the creation of institutional structures like the Horticultural Products Marketing Corporation, and the creation of infrastructural support, is not dependent upon having an extensive hinterland. Such activities are worth documenting in order to facilitate their replication.

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# 27

# A LOCAL RESOURCE-CENTRED APPROACH TO RURAL TRANSFORMATION: AGRO-BASED COTTAGE INDUSTRIES IN WESTERN SICHUAN, CHINA

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## CONTENTS

## INTRODUCTION

Agro-based cottage industry involves the use of house and courtyard space for plant and animal husbandry; in addition, it involves the manufacture of handicrafts. Concurrently, peasant farmers forage for wild plants and hunt for wild animals and carry out the rough processing of their products. This activity is not new, as it has long been a subsidiary occupation in China.

This paper covers the Ganzi Tibetan Autonomous Prefecture, the Aba Tibetan and Qiangs Autonomous Prefecture, and Lianashan Yi Autonomous Prefecture in Sichuan. The total area of all three is over 300,000 sq km and their population is 4.8 million. About four million people (approximately 82.06%) are involved in agriculture and 0.4 million (8.3%) in animal husbandry. The agriculturalists are distributed throughout the mountain areas and river valleys, and those involved in animal husbandry mainly inhabit the plateau of Northwestern Sichuan. Agro-based cottage industries are mainly concentrated in the agricultural areas.

The paper illustrates approaches to harnessing the 'niche' and diversity characteristics of mountain areas (Jodha, Chapter 2) and thereby exhibits the mountain perspective of agro-based cottage industries in selected areas of China.

## POSITIVE FACTORS IN THE DEVELOPMENT OF AGRO-BASED COTTAGE INDUSTRIES

### Abundance and Diversity of Natural Resources

The region is one of the richest in China for a variety of animals, plants, and edible and medicinal fungi. There are over 800 species of animals, 6,000 species of plants, and over 200 species of fungi. Among them are a number of well-known and rare species such as Chinese caterpillar fungus (*Cordyceps sinensis*), glossy ganoderma (*Ganoderma lucidum*), black edible fungus (*Auricularia auricula*), white edible fungus (*Tremella fuciformis*), golden edible fungus (*Tremellia mesenterica*), fragrant mushroom (*Lentinus edodes*), pine mushroom (*Tricholoma matsutake*), hedgehog hydnum (*Hericium erinceus*), morel (*Morchella esculenta*), musk, bear's gallbladder, young pilous antler pangolin (*Manis pentadactyla*), salamander (*Batrachuperus pinchonii*), squirrel (*Tupaia glis chinensis*), the bulb of fritillary (*Fritillaria cirrhosa*), Forbes' notopterygium (*Notopterygium forbesii*), large-leaved gentian (*Gentiana macrophylla*), the root of membranous milk vetch (*Astragalus membranaceus*), the root of herbaceous peony (*Paeonia veitchii*), Auchandia (*Aucklandia lappa*), Chinese Nardostachys (*Nardostachys chinensis*), and Chinese Ligusticum (*Ligusticum sinense*). They are of high yield and good quality.

Sericulture is an example of a profitable cottage industry that could be developed throughout the river valleys of the sub-tropical zone. The mulberry plant flourishes there, sustaining fresh leaf growth throughout the winter and shedding only in the dry season. As many as four or five generations of silkworm can be bred in one year, and this is double the number raised in the Yangtze River Basin. The quality of silk is very fine, because of the natural resources and the conditions prevailing throughout West Sichuan.

### Climate

There is an obvious bio-climatic variation throughout the low to the high elevations. At low elevation, conditions are sub-tropical and these change in the frigid temperate belt, culminating in a permanent snow belt. Inter- and intra-climatic belts have a wide variety of topography and flora and fauna: 'four seasons on one mountain and different climates within a five kilometre radius.' This range of topographies and climates is advantageous for the growth and abundance of living things and natural resources.

There are generally 1,500–2,000 hours of strong sunshine per year and the heat distribution decreases from the low river valleys to the high mountains. The daily range of temperature is great and the annual range small, and this creates beneficial conditions for photosynthesis. The small annual range promotes the stability of stenothermic species. Most of the land is cultivable and, in general, conditions are excellent for the development of a variety of agro-based cottage industries throughout the various belts.

## THE DIVERSITY OF POSSIBLE PRODUCT DEVELOPMENT

Given the natural environment, the products that can be developed are wide-ranging. They fall into three main categories and these are described in the following passages.

### Plant-based Cottage Industries

The cultivation of flowers, fruits, herbal medicines, and some plants, which are not only useful for domestic decoration purposes but also for income-generating activities, is possible in Western Sichuan where many species and varieties of plants are of economic value. They include the *bailan (Michelia alba)*, mango (*Mongifera indica*), tamarind (*Tamarindus indica*), and grape (*Vitis vinifera*), cultivated in the sub-tropical valley of the Jinsha River and the Anning River; a variety of oranges, cottage bamboo (*Sinocalamus affinis*), peaches, and cherries, cultivated in the Luding area of the Dadu River Valley and the low and middle belts of the hills along the Anning River Valley; and apples, walnuts, and wild peppers (*Zanthoxylum simulans*), cultivated in the middle or upper reaches of the Dadu River and the Minjiang River.

### Animal-based Cottage Industries

In addition to raising domestic fowl and animals, peasant farmers are also engaged in apiculture, sericulture, and breeding animals such as roe-deer, deer, bears, and ermine. A limited number of farmers breed bull frogs, but not yet on any substantial commercial scale. However, pheasant breeding has already become a profitable industry.

### Agro-cottage Industries Based on Handicrafts and on Plant Collection

Handicrafts include weaving, braiding, embroidery, woodwork, and ironwork based on the traditional crafts of the minority nationalities. The collection of plants for herbal medicines and the processing of wild fruits, vegetables, and edible fungi, many for indigenous use, is also carried out as a subsidiary occupation.

According to the rough statistics available, there are approximately 300–400 products that can be produced in this region. This provides a substantial basis for the development of agro-based cottage industries.

## Flexibility in Implementation

Production is carried out within the family unit. Scale of production is small with short lead times for finished products. The fixed assets and amount of investment involved is very little and, since most of the work is not physically exacting, cottage industries create job opportunities for the old and the handicapped also. Since products can be changed easily, the risks involved are minimal. When there is a glut of one product on the market, production can be diverted to another product without causing significant loss. Both the benefits and the advantages of cottage industries are obvious.

## Existing Foundation for Cottage Industries

The level of cottage industry development is indicative of the level of the commodity economics in the region. For a long time, this region remained a self-sufficient subsistence economy area and commercial transactions were carried out through barter exchange. However, most of the produce was for self-consumption. During the last decade, many changes have taken place and changes in productivity have resulted in a transition from a self-sufficient subsistence economy to one that is based on commodity production and marketing exchange. This has stimulated the development of agro-based cottage industries (Table 27.1).

**Table 27.1. The development of subsidiary occupations in Western Sichuan**

| Year | Ganzi | | | Aba | | | Liangshan | | |
|---|---|---|---|---|---|---|---|---|---|
| | TOVA | OVSO | % | TOVA | OVSO | % | TOVA | OVSO | % |
| 1950 | 10,160 | 747 | 7.35 | 5,581 | 1,035 | 18.55 | 16,671 | 1,409 | 8.45 |
| 1957 | 11,070 | 850 | 7.68 | 8,240 | 1,573 | 19.09 | 25,666 | 2,104 | 8.20 |
| 1965 | 12,938 | 1,186 | 9.17 | 11,938 | 1,769 | 14.82 | 35,601 | 3,357 | 9.43 |
| 1970 | 15,349 | 1,259 | 8.20 | 12,515 | 2,029 | 16.21 | 37,508 | 2,877 | 7.67 |
| 1975 | 18,613 | 1,748 | 9.39 | 15,801 | 2,312 | 14.63 | 45,229 | 4,129 | 9.13 |
| 1980 | 19,713 | 1,501 | 7.61 | 20,903 | 2,448 | 11.71 | 59,168 | 6,110 | 10.33 |
| 1985 | 29,931 | 4,424 | 14.78 | 29,111 | 4,625 | 15.89 | 88,099 | 13,050 | 14.81 |

Notes:

The numbers are calculated on 1980 values.
The unit of output value is ten thousand yuan.
TOVA = the total output value of agriculture.
OVSO = the output value of subsidiary occupations.
% = OVSO as a percentage of TOVA.
There are 4.70 yuan to one U.S. dollar.

*Source*: Ao Chepu et al. 1988

Throughout the river valleys in the southern part of this region, almost every farming family raises bananas. The average annual income per family is 200–300 yuan annually, but in some families it is as much as 1,000 yuan.

Plantations of the flower *bailan* (*Michelia alba*) are a new feature throughout the river valleys of the south. In Ningnan County, in particular, in two villages, every family has planted three trees or more. After three years of growth the trees yield more than 10,000 flowers a year and they bring in an income of over 200 yuan. After five years of growth, each tree will yield 20,000 flowers annually, thus realising an average income of 400 yuan.

In Luding and Mao County, wild pepper is sold. On an average each family earns over 400 yuan but as much as 700–800 yuan can be earned. Table 27.2 shows the production of wild pepper in Western Sichuan from 1965 to 1985.

**Table 27.2. The production of wild pepper in Western Sichuan, 1965–1985**

(in kg)

| Year | Ganzi | Aba | Liangshan |
|---|---|---|---|
| 1965 | 63,550 | 101,350 | 156,200 |
| 1970 | 91,600 | 172,050 | 48,750 |
| 1975 | 83,650 | 151,900 | 68,200 |
| 1980 | 99,100 | 125,850 | 271,600 |
| 1983 | 157,850 | 161,850 | 459,500 |
| 1985 | 208,350 | 270,950 | 844,500 |

*Source*: Ao Chepu et al. 1988

Apart from in Mao County, there was no apple production on a large scale before the 1970s (see Fig. 27.1). A few farmers planted trees to meet the needs of the indigenous inhabitants. After the 1970s, families began to plant apple trees on a large scale and not only are local requirements met but large amounts of apples are also sold in Chengdu and Zhongging (Table 27.3).

**Table 27.3. The production of apples since the 1970s**

(in tons)

| Year | Butuo | Puge | Xide | Yuexi | Yanyuan |
|---|---|---|---|---|---|
| 1970 | 0.1 | 0.4 | 0.0 | 0.6 | 15.0 |
| 1975 | 177.5 | 5.2 | 8.4 | 212.5 | 174.9 |
| 1980 | 9.5 | 28.8 | 152.5 | 477.9 | 560.3 |
| 1983 | 475.8 | 154.9 | 278.2 | 1,323.0 | 1,805.3 |
| 1985 | 423.6 | 298.0 | 788.2 | 2,215.8 | 2,252.9 |

*Source*: Ao Chepu et al. 1988

Apples are now a significant source of income for many peasants. In addition, peasant will always produce a number of other products, as can be seen in the following examples of two families in Jinzhou Village of Mao County in 1989.

These two families represent the higher and lower income groups in the village. In the 1970s, their income from grain was twice as much as it is now, but there were very few other sources of income.

At present, the use of gardens to cultivate strawberries, plums, and cherries has been considerably successful in various districts. Gardens have also been used to breed silkworms and sericulture has rapidly developed (see Table 27.4).

The production of cocoons in Ningnan County reached 800 tons in 1989, and the

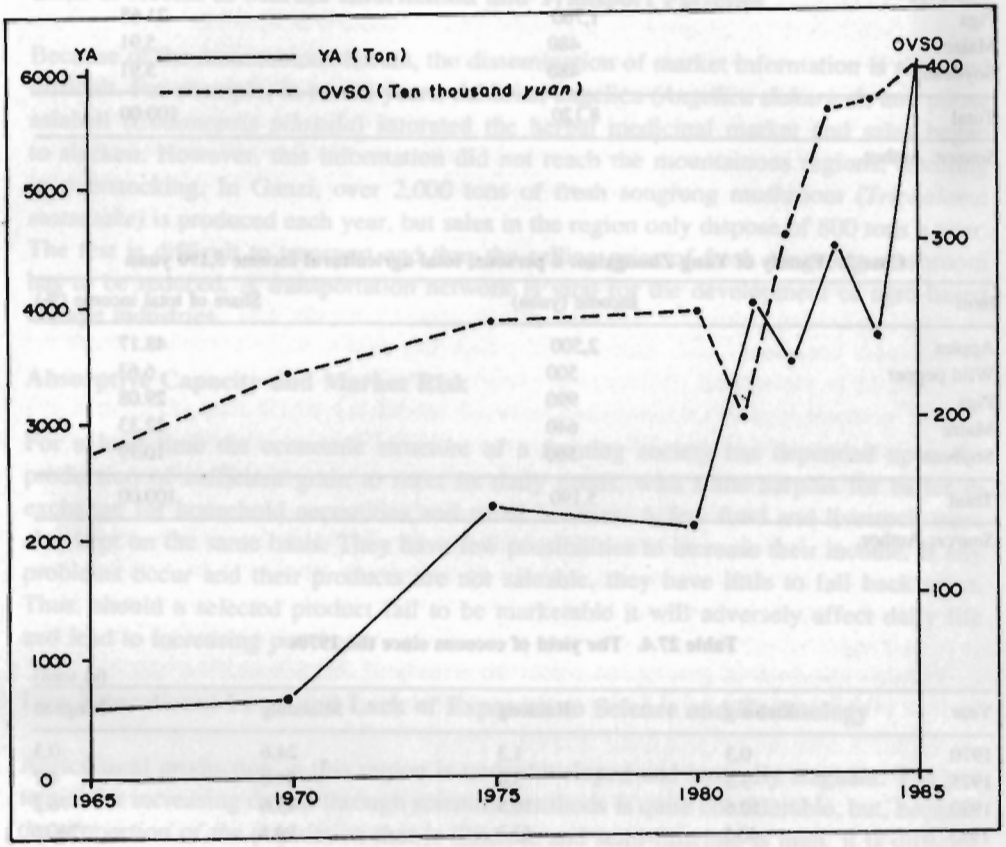


**Figure 27.1: The production of apples and the output value of subsidiary occupations in Mao County, 1965–1985**

Note: YA = the production of apples; OVSO = the output value of subsidiary occupations.

Source: Ao Chepu et al. 1988.

average income per family increased to 500 yuan. With the development of sericulture, the silk filature industry also developed. A silk filature mill with an output of 70 tons per year has been built, and it employs 600 people. This has led to the opening up of many more job opportunities.

Other cottage industries involve the planting of medicinal herbs; in addition, the rough processing of edible fungus and fodder and grain are new cottage industries that have emerged within the last decade.

**Case 1. Family of Chen Mingxin: 5 persons; total agricultural income 8,120 yuan**

| Item | Income (yuan) | Share of total income (%) |
|---|---|---|
| Apple | 4,800 | 59.11 |
| Wild pepper | 600 | 7.39 |
| Pigs | 1,760 | 21.68 |
| Maize | 480 | 5.91 |
| Soybean | 480 | 5.91 |
| Total | 8,120 | 100.00 |

*Source*: Author.

**Case 2. Family of Yang Zhongxiao: 6 persons; total agricultural income 5,190 yuan**

| Item | Income (yuan) | Share of total income (%) |
|---|---|---|
| Apples | 2,500 | 48.17 |
| Wild pepper | 500 | 6.63 |
| Pigs | 990 | 29.08 |
| Maize | 640 | 12.33 |
| Soybean | 560 | 10.79 |
| Total | 5,190 | 100.00 |

*Source*: Author.

**Table 27.4. The yield of cocoons since the 1970s**

(in tons)

| Year | Xichang | Huidong | Mianning | Ningnan |
|---|---|---|---|---|
| 1970 | 0.3 | 1.3 | 24.6 | 0.3 |
| 1975 | 3.5 | 3.0 | 34.8 | 4.7 |
| 1980 | 10.6 | 10.5 | 43.6 | 76.2 |
| 1983 | 40.5 | 65.8 | 94.6 | 240.6 |
| 1985 | 79.5 | 119.3 | 94.4 | 405.9 |

*Source*: Ao Chepu et al. 1988

## NEGATIVE FACTORS IN THE DEVELOPMENT OF AGRO-BASED COTTAGE INDUSTRIES

In reviewing the last decade, we have discovered many constraints to the development of agro-based cottage industries, and these have been summed up in the following passages.

### Distance from Market

Most of the cottage industry products are small items for daily use or edible consumer goods such as fresh edible fungus, fresh vegetables, and other mountain products. Goods

that are difficult or expensive to transport are not suitable for production in this environment because the major markets are too far away.

### Lack of Access to Market Information and Transport Facilities

Because of the mountainous terrain, the dissemination of market information is slow and difficult. For example, in recent years, dahurian angelica (*Angelica dahurice*), and pilose asiabell (*Codonopsis pilosula*) saturated the herbal medicinal market and sales began to slacken. However, this information did not reach the mountainous regions, resulting in overstocking. In Ganzi, over 2,000 tons of fresh songrong mushroom (*Tricholoma matsutake*) is produced each year, but sales in the region only dispose of 800 tons a year. The rest is difficult to transport and thus the selling price of fresh songrong mushroom has to be reduced. A transportation network is vital for the development of agro-based cottage industries.

### Absorptive Capacity and Market Risk

For a long time the economic structure of a farming society has depended upon the production of sufficient grain to meet its daily needs, with some surplus for barter in exchange for household necessities and small luxuries. A few fowl and livestock were also kept on the same basis. They have few possibilities to increase their income. If any problems occur and their products are not saleable, they have little to fall back upon. Thus, should a selected product fail to be marketable it will adversely affect daily life and lead to increasing poverty.

### Low Educational Level and Lack of Exposure to Science and Technology

Agricultural production in this region is underdeveloped and basically stagnant. The potential for increasing output through scientific methods is quite considerable, but, because the proportion of the population that is illiterate and semi-illiterate is high, it is difficult to introduce and popularize advanced technology. This also hinders the development of agro-based cottage industries.

## APPROACHES AND STRATEGIES FOR THE DEVELOPMENT OF AGRO-BASED COTTAGE INDUSTRIES

### The Principles for Selecting the Type of Industry

*Comparative Advantage and Market Demand*

The predominant resources in each area should be selected as development items, given the variety of resources, topographies, climates, flora, and fauna throughout the region. In this region, edible fungi, such as wild fragrant mushroom (*Lentinus edodes*) and songrong mushroom, are the predominant resources throughout the three prefectures. In 1988, songrong mushroom brought in a revenue of 80 million yuan in Ganzi Autonomous Prefecture, and this averaged out at 100 yuan per capita. Earnings in Xiangcheng, Daucheng, Yajiang, and Jioulong counties were as high as from 10,000 to

20,000 yuan. This is due to the abundance of oak (*Quercus* spp.) and Yunnan pine forests (*Pinus yunnanensis*). Both species are symbiotic with songrong mushroom.

The correct techniques for processing this mushroom are easily mastered by peasant farmers in comparison to those for processing common mushroom (*Agaricus bisporus*), common mushroom (*A. campestris*), and umbrella mushroom (*Pleurotus ostreatus*), which are difficult to process and store. The latter are not a good option for this area because they are easily damaged by micro-organisms. In order to promote agro-based cottage industries, items must be selected carefully according to the availability of natural resources and market demand. The latter two are interlinked. Without market demand, abundant natural resources alone will not create a dynamic economy.

*Local Specialization*

Because of limited transportation and communication facilities and the lack of science and technology, products from this region cannot compete with like products from other areas. Therefore, those products for which this region has a comparative advantage should be developed. Within this category are Chinese medicinal herbs such as Forbes' notopterygium (*Notopterygium forbesii*), tendril-leaved fritillary (*Fritillaria cirrhosa*), and large-leaf gentian (*Gentiana macrophylla*). These are famous products from this area. Their processing should be developed into a basic pharmaceutical industry, since there is not a lot of competition for these products.

Sericulture, which is a principal industry in the Jinsha River Valley, as well as throughout its hinterland, is another example of an industry for which the area has comparative advantages. Silkworms can be bred there at the rate of four or five generations a year in comparison to the lower regions of the Changjiang River where only one or two generations can be bred yearly and where the quality of the silk is not so good. In the valleys of Ningnan and Miyi County, the insolation is excellent, making it possible to grow *bailan* (*Michelia alba*) and mangoes (*Mongifera indica*) in cottage gardens. Earnings, on an average, for each family are as much as 600 to 1,000 yuan annually, and this is 25 to 40 per cent of the total earnings from agriculture. In developing agro-based cottage industries it is always important to build on existing strengths and circumvent weaknesses.

*Economies of Scale*

One of the principal aims in promoting cottage industries is to foster self-sufficiency. This is quite difficult, especially in terms of sufficient productivity and market share, when each family develops its own subsidiary occupation or cottage industry. The breeding of bull frogs is a case in point. This is only pursued in a few families and the amounts produced are not sufficient to have any significant impact in terms of market share. To develop agro-based cottage industries, it is essential that inter-linkages among the families involved are established. At present, farmers have a number of integrated activities that are initiated by them in order to achieve a better scale of production.

*Cultural Standards: Acceptance and Levels of Technology*

The culture of the area is traditional and conservative; as a result, educational standards are low. Consequently, technology is primitive and the acceptance of new technology quite low. In order to ameliorate this situation, it is essential to raise the standards

of the farmers through training and through increasing the number of technologically skilled personnel in the region. In this way, natural resources will be used for all-round development.

*Improvement of the Agro-ecological Environment*

Two main factors should always be considered in establishing agro-based cottage industries. First, pollution-causing industries should never be permitted, and, second, the gathering of wild plants and the hunting of wild animals should be kept within rational limits. The continuity of natural resources must be a principal concern of all parties involved. Sustainability of both the natural resources and the dependent activities are interlinked.

## The Major Alternatives Available

Within the context of the above principles, four development factors are discussed for consideration.

*Cultivation of Plants*

**Fruits.** In the southern part of the region, tropical and sub-tropical **fruits**, such as guavas, can be the main crops, and oranges, peaches, and plums can be cultivated mainly in the lower mountain areas. Pears and wild peppers can be grown in the middle and high mountains. The northern areas of the region are suitable for the growth of apples, grapes, strawberries, walnuts, cherries, and wild peppers. The developing industrial base in the south will provide the main market for fruits from the southern part of the region and Chengdu and the northern tourist centres will provide markets for fruits cultivated in the north.

**Herbal medicines.** There are a variety of **herbal medicines** in this region and species differ from the south to the north. In the south, villous amomum (*Amomum villosum*), galanga resurrection (*Kaempferia galanga*), common andrographis (*Andrographis paniculata*), and wrinkled gianthyssop (*Agastache rugosus*) are the main plants found and, in the northern area, tinata pinellia (*Pinellia terata*) and rough gentian (*Gentiana scabra*) are the principal medicinal herbs (Table 27.5).

**Flowers.** The **flowers** that are most marketable are *bailan* (*Michelis alba*) and jasmine (*Jasminum sambac*) in the south and roses (*Rosa* spp.) in the north.

**Edible fungus.** Species such as black fungus (*Auricularia auricula*), white fungus (*Tremella fuciformis*), and fragrant mushroom (*Lentinus edodes*) can be cultivated as cottage industry products on family farms. The farmers have already had a lot of experience in cultivating fuling (*Poria cocos*). It can be established on a planned basis.

*Animal and Insect Products*

Sericulture can be further developed in the south of the region and apiculture in the north. The musk deer and bear can be bred in the mountain districts and the domestication and breeding of ermine (*Mustela erminea*) and coypu (*Myocastor coypus*) placed on a firm footing and encouraged throughout the area.

**Table 27.5. Yields from major medicinal plants in Western Sichuan, 1950–1985**

| Year | FC (ton) | RO (ton) | NC (ton) | CS (ton) | Musk (kg) |
|---|---|---|---|---|---|
| 1950 | 36.53 | 0.26 | 0.0 | 6.67 | 67.90 |
| 1960 | 66.68 | 11.69 | 601.1 | 6.47 | 755.50 |
| 1970 | 84.79 | 12.56 | 211.8 | 22.07 | 689.70 |
| 1975 | 59.71 | 18.21 | 562.2 | 12.60 | 481.15 |
| 1980 | 60.67 | 4.48 | 41.4 | 2.85 | 792.45 |
| 1983 | 68.95 | 3.68 | 121.4 | 4.41 | 164.00 |
| 1985 | 149.87 | 10.31 | 650.5 | 26.60 | 266.00 |

Key: FC = *Fritillaria cirrhosa*
RO = *Rheum officinale*
NC = *Nardostachys chinensis*
CS = *Cordyceps sinensis*

*Source*: Ao Chepu et al. 1988

*Cottage Industries Based on Processing*

Currently, processing industries are mainly concentrated on the basic processing of herbal medicines, grain, fodder, edible fungi, wild vegetables, and some simple household necessities that have a wider national market.

*Gathering of Wild Plants*

Both edible and medicinal fungi have remained relatively unexploited. In the 1960s, there was a market for lingzhi mushroom (*Ganoderma lucidum*). Its annual yield is 20 tons. The 1980s saw an increase in the market for songrong mushroom, and the annual yield of salted fungus from this species in 1988 was more than 1,100 tons. The total output value is 100 million yuan.

In recent years, vegetable fern (*Pteridium aquilium*, var. *latiusculum*, a kind of wild vegetable) has been introduced as a new product. The approximate preliminary statistics for 10 counties, including Dechang, Maoxian, Wenchuan, Ludin, Mianning, and Xichang, show that the annual yield will be over 500 tons in 1990, selling at 4,000 to 5,000 yuan per ton. This product alone has increased the total output value of the area by 200 to 250 million yuan.

Herbal medicines have been the basis for the principal subsidiary occupation of villagers in this region and for a long time the sale of such products has constituted the principal source of income.

Finally, there are many varieties of wild fruits, which can be used in agro-based cottage industries, such as roxburgh roses (*Rosa roxburghii*), seabuckthorn (*Hippophae rhamnoides*), Kansu crabapple (*Malus Kansuensis*), and Tibetan crabapple (*Malus transitoria*).

## Project Implementation

*Local Government Support*

Agro-based cottage industries offer many important prospects to assist underdeveloped areas in overcoming poverty and backwardness. The local governments in such areas need to offer every possible support to these industries by popularizing them, making

funds available for their development, and introducing the technological skills needed. An example of measures that can be undertaken by local governments can be shown by using the case of the exploitation of vegetable fern in the piedmont of Erlang Mountain in Tianquan County. To develop this industry successfully a number of measures were taken by the Government of Tianquan County, and these have been described below.

- A professional body of 100 members was formed by the County's Native Product Company to be responsible for the production of vegetable fern.
- A production plan, with duties assigned to every team member, was decided upon before the plants were gathered by the villagers. The professional body divided the work up among the families and individuals involved and delegated the responsibility for that work.
- Information about the project was disseminated to every household.
- A training course in the techniques of gathering and processing was held, including demonstrations in the field. The Native Product Company, which had delegated the responsibilities for production, was able to buy 30 tons of vegetable fern within a very short period of time.

  In Miyi County, the local government reduced taxes on the sale of this product or even remitted them. This encouraged the industry, improved its marketability, and increased the income of the villagers.

*Production and Processing Arrangements*

The *Yi* ethnic group, which inhabits Lianhe Village in Mianning County, had over 10,000 wild mulberrry bushes in their village. These were not used to breed silkworms, but rather the leaves were gathered to feed the pigs. The local government encouraged silkworm breeding by:

- paying compensation for cocoon yields of less than 25 kg on one sheet, and
- engaging a technical advisor to instruct the *Yi* in silkworm breeding.

As a result of these measures, 60 households bred more than 40 sheets of silkworms. The total yield of the cocoons was as high as 1,400 kg, with an approximate value of 13,000 yuan, bringing in an average earning of 200 yuan per household.

The local government disseminated facts about silkworm breeding and popularized the occupation. The next measure taken was to plant more mulberry bushes on barren and waste land. In the autumn of 1989, 150,000 bushes were planted under the guidance of the Agricultural Bureau. It is planned to plant 200,000 bushes in 1990, and that, by 1992, every family will have two sheets of silkworms. This has brought about improvements in the economy of the County. Silk filature mills have been built in both Mianning and Ningnan counties. The annual yield from the mill in Ningnan alone is about 200,000 kg and the mill employs 600 people. The local government's support has encouraged the establishment of linkages in order to achieve maximum economic benefits.

*Application of Advanced Science and Technology*

Advanced science and technology is essential in the optimum development of agro-based cottage industries. Because such technology was available, Ganzi Autonomous Prefecture was able to process goat wool, which fetches 30 yuan for every 100 g. It is expensive, because it is difficult to process this wool. This activity has developed to a

stage at which every family has 10 goats. Each goat provides 100 g of wool which brings in 300 yuan per year per family. Likewise, improvements in salsifying techniques have led to an expansion in the songrong mushroom processing industry. More importance has to be given to science and technology in the promotion of agro-based cottage industries.

*Support Services*

The development of agro-based cottage industries requires a concurrent development of services. These should include disease prevention and control, seed selection, storage, desiccation, packing, and forwarding services. This way the quality of products can be guaranteed and cottage industries firmly established.

*Market Research and Feedback*

To develop agro-based cottage industries, market feedback is necessary. Unless the products keep up with supply and demand, agro-based cottage industries will not establish a firm footing. To ensure that this happens, market research to determine supply and demand is essential. Products should be modified and changed continuously according to market fluctuations.

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# 28

# THE SMALL FARMERS' DEVELOPMENT PROGRAMME IN NEPAL: INSTITUTIONAL INITIATIVE IN POVERTY ALLEVIATION

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## CONTENTS

## INTRODUCTION

The Small Farmers' Development Programme (SFDP) is the first development programme in Nepal directed towards a specific segment of the population rather than towards a specific sector of the economy such as agriculture, irrigation, or forestry. It is targeted at the rural poor, i.e., the small farmers, the tenants, the landless, and the artisans. Small and marginal farmers were ignored by general agricultural programmes such as extension, research, and credit in their bid to boost agricultural production, rather than to alleviate poverty—a much more difficult and complex task.

Generally, extension and credit agencies were inclined, quite understandably, to overlook marginal farmers because of the extremely small size of their landholdings and their very low contribution to total agricultural production, even though they heavily outnumbered the better-off farmers. Instead, these agencies tended to concentrate their efforts on farmers with larger holdings where substantial gains in production could be made. General agricultural programmes were, as such, not geared to the needs and limitations of poor and marginal farmers. Extension messages often had little relevance to the conditions of the small farmer, while research programmes had not addressed the need to maximize income from very small holdings through the development of integrated farming packages suited to them. In the field of credit, there was a built-in bias among credit institutions favouring larger loans to bigger farmers, as such loans were easier and less costly to administer. On the other hand, smaller borrowers found institutional credit uneconomic because of the high transaction costs involved. A programme aimed at the poorest farmers, and tailored to their needs and problems, was therefore clearly needed. The SFDP seeks to meet this need.

Even though the SFDP is implemented by the Agricultural Development Bank of Nepal, it is much more than a credit programme. It is more of an integrated or community development programme, credit being an entry point to reach the target group. Conceived and initiated as an action-cum-research project in two areas, one in the *Terai* (plains) in 1975 and another in the hills in 1976, the SFDP has now grown into an effective national programme reaching 110,000 member-farmers in 456 project areas of all the 75 districts of the country (see Table 28.1). The programme has been visibly successful in many project areas, although several weaknesses have surfaced in the course of its implementation and expansion. An effort will be made here to describe the programme in its essentials and to analyse and assess it, both in concept as well as in implementation, and with special reference to the situation prevailing in the mountain areas of Nepal.

It must be remembered here that the SFDP is not a specific response to the mountain specificities of Nepal. It is a country-wide programme aimed at alleviating poverty which is pervasive throughout the country, but is concentrated more heavily in the mountains. However, the programme seeks to address the needs arising from many of the mountain characteristics such as marginality, inaccessibility, and fragility. It should be emphasized here that marginality as it applies to people is not exclusively applicable to the mountain areas of Nepal.

**Table 28.1. Growth in SPOs, groups, members, and loan disbursement under SFDP**

| Year | No. of SPOs (cumulative) | No. of groups (cumulative) | Groups per SPO (average) | No. of members (cumulative) | Members per group (average) | Annual Loan Disbursement (in thousands of rupees) |
|---|---|---|---|---|---|---|
| 1975/76 | 2 | 28 | 14.00 | 443 | 15.82 | 453 |
| 1976/77 | 15 | 128 | 8.53 | 1,443 | 11.27 | 1,120 |
| 1977/78 | 17 | 296 | 17.41 | 3,205 | 10.83 | 2,515 |
| 1978/79 | 24 | 461 | 19.21 | 5,121 | 11.11 | 3,357 |
| 1979/80 | 29 | 634 | 21.86 | 6,623 | 10.45 | 3,865 |
| 1980/81 | 30 | 786 | 26.20 | 7,974 | 10.15 | 4,953 |
| 1981/82 | 54 | 1,276 | 23.63 | 12,831 | 10.06 | 12,467 |
| 1982/83 | 84 | 2,239 | 26.65 | 21,319 | 9.52 | 25,580 |
| 1983/84 | 121 | 3,196 | 26.41 | 29,552 | 9.25 | 42,469 |
| 1984/85 | 162 | 4,554 | 28.11 | 41,603 | 9.14 | 70,363 |
| 1985/86 | 250 | 6,061 | 24.24 | 52,864 | 8.72 | 96,718 |
| 1986/87 | 298 | 7,463 | 25.04 | 63,112 | 8.46 | 99,880 |
| 1987/88 | 346 | 9,188 | 26.55 | 78,518 | 8.55 | 149,866 |
| 1988/89[a] | 416 | 11,596 | 27.88 | 95,968 | 8.28 | 202,819 |
| 1989/90[b] | 456 | 13,898 | 30.48 | 110,570 | 7.96 | 203,063 |

[a]1988/89 figures are provisional.

[b]Figures for 1989/90 pertain to first nine months of the fiscal year.

*Source*: Annual Report of the SFDP for 1987/88, ADBN.

## SFDP OBJECTIVES AND APPROACH

The main objective of the SFDP is to improve the social and economic well-being of the rural poor by introducing and developing institutions that can enhance their capacity to participate more fully in economic and social programmes designed to benefit them. The SFDP has introduced the concept of group formation with a view to creating a structure and mechanism for demanding, receiving, and using, more effectively, the development services and inputs offered by government agencies, and to enabling them to move towards self-reliance. More specifically, the SFDP seeks to:

(1) build up the institutional base for organizing the disadvantaged and the rural poor into small farmers' groups around common economic activities and/or production resources;
(2) provide supervised credit in order to enable these groups to undertake a diversified range of income-generating activities that are tailored to suit their needs and capabilities;
(3) adapt the local services' delivery mechanisms to the needs of the rural poor;
(4) provide training and technical assistance to ensure effective use of the facilities provided by the project; and
(5) develop self-reliance among these groups so as to enable them to plan and carry out their own projects (IDS 1989a).

The underlying idea is that the small farmers, tenants, and the landless, by organizing themselves into small cohesive groups, will be better equipped to receive credit and other services offered by public and private agencies, and that their capacity to use credit and improve productivity will be enhanced if they have greater access to various social

services and to types of training that upgrade their skills. The programme also seeks to enhance their involvement in various activities such as community development, resource conservation, community forestry, population education and family planning, sanitation, and women's development. The SFDP also promotes the creation and development of community assets by constructing small irrigation facilities or school buildings through group and inter-group action. It also seeks to enhance the economic welfare of the poor by discouraging wasteful expenditure on social ceremonies, as well as drinking and gambling. In this way, credit, production support, community development, and social reforms are all integrated into the SFDP. Group action is the main vehicle used for achieving the objectives of the programme.

## SITUATION IN THE MOUNTAINS

It may be relevant at the outset to describe briefly some of the important characteristics of the mountain areas of Nepal, for a better understanding of the SFDP, as it operates in these areas.

Geographically, the country can be broadly divided into three belts: (1) the Southern belt or *Terai*, covering 23 per cent of the physical area, (2) the middle hills covering 43 per cent of the area, and (3) the high mountains (above 3,000 m in altitude), covering the remaining area of the country. In this paper, both the Middle Hills and the High Mountains will be referred to as mountains. Some of the characteristics of the mountain areas in Nepal are outlined in the following passage.

First, most of the farmers in the mountains are marginal. The highest concentration of absolute poverty, estimated at 48.1 per cent, exists in the rural hills of Nepal as against only 29.4 per cent in the rural *Terai*. The average size of operational holdings of more than the lowest 50 per cent of the farmers in mountain areas is less than one-fifth of one hectare, often with less fertile soil and lesser access to irrigation. As the small pieces of land owned by such farmers cannot provide adequate support to their families, they have to take recourse to seasonal migration (estimated at 30% to 40% of the population) to the *Terai* or to India, in order to provide for their basic needs. Second, access to most of the areas in the mountains is extremely difficult. Difficulties are caused not only by widely scattered settlements throughout the mountains but also by difficult terrain, and by a dearth of sufficient and dependable trails, tracks, and bridges. It is estimated that two-thirds of the mountain population live more than one day's walk from a motorable road. Third, the mountains of Nepal are by nature very fragile and erosion-prone because of their topography and their recent (geological) formation. Encroachment by man in search of food, fodder, and fuelwood has made matters worse. Fourth, the mountain areas are interspersed with many valleys with their own micro-climates, often diverse agricultural patterns and practices. Fifth, the carrying capacity of the hills appears to have been reached and even exceeded in many areas. Significant out-migration from the hills is taking place in search of employment. Productivity is falling as more and more marginal and unsuitable lands are being brought under cultivation to meet the growing needs of a rapidly rising population, with disastrous consequences for the environment. Environmental degradation in the mountains appears to be both a cause and a consequence of low agricultural productivity. Forest lines continue to recede from the settlements causing villagers to spend more time in gathering fuelwood and fodder. Sixth, per capita

availability of cereal grains has been declining in most of the mountain areas. Almost 45 per cent of the households are now estimated to consume less than the recommended levels of food.

It is in this setting that the SFDP, essentially a poverty alleviation programme, is being implemented.

## INSTITUTIONAL SET-UP OF THE SFDP

### Implementation Framework

The SFDP is administered by the Agricultural Development Bank of Nepal through its network of 456 sub-project offices (SPOs) scattered over the entire country. There were 220 SPOs in the mountains and 124 in the *Terai* at the end of 1987/88. The SPOs are headed by bank officials, designated as Group Organizers (GOs), who are mainly responsible for implementing the programme. The GOs are assisted by support staff as needed. Staffing depends upon the nature and volume of activities in the SPO. Most of the SPOs, especially the new ones, are manned only by one GO and a peon. There are Women's Group Organizers working under the GOs in 63 SPOs where women's development activities are also undertaken. The SPOs are supervised by 'control offices' which may be district branches or sub-branches of ADB/N. Zonal offices of the bank also extend general supervision over the SPOs. Overall direction and control is exercised by the SFDP division at the centre.

### Procedure for Group Formation

As soon as an SPO is established in an area, the GO organizes a meeting of the villagers, to explain to them the objectives of the SFDP, the procedure for organizing groups, their working methods, and the benefits of joining the group. The GO then organizes a preliminary household survey to identify the small farmers in the area. Households with a per capita income of Rs 1,200 qualify as small farmers (ADB/N 1987). In the beginning, the criterion of the size of holdings was adopted but was later abandoned in favour of the income criteria.

Farmers wishing to form a group have to apply to the GO and sign a memorandum pledging:

- to discuss, plan, and undertake social/community and economic development programmes for the group or its members and to borrow from the SPO if necessary,
- to be liable collectively for that portion of the loan that a member of the group may not be able to repay,
- to exercise collective pressure on the member who defaults on his repayment and not to demand further loans from the SPO until the defaulting member repays his loans, and
- to collect savings from group members regularly (ADB/N 1987).

A detailed survey is then made of the farmers who decide to form or join the group. Farmers are organized into small groups of 5 to 12 members each. In the earlier stages of the programme, the groups were larger, but smaller groups are now considered to be more effective. A group, on an average, consists of eight to nine members and a SPO

has 25 to 30 groups. Soon after a group is formed, it elects a leader who is literate and who is considered to be a man of integrity, having the motivation for community service. The group then proceeds to discuss and prepare its social and economic programme based on the skills and capabilities of its members. The GO helps the group to draw up such plans and to keep records of the meetings that must take place at least once a month.

More than 14,000 small farmer-groups, with a total membership of 110,000, had been formed by March 1990. Details regarding the number of SPOs, groups, and members in the mountains and the *Terai* in 1987/88 are given below. The average number of groups and members per SPO is much lower in the *Terai* than in the mountains, reflecting the relative inaccessibility of the mountain areas.

| Particulars | Mountains | *Terai* | Nepal |
|---|---|---|---|
| No. of SPOs | 4,769 | 4,476 | 9,188 |
| No. of Groups | 222 | 124 | 346 |
| No. of Members | 40,921 | 38,152 | 79,073 |
| Groups per SPO | 21.5 | 36.1 | 26.6 |
| Members per SPO | 184 | 307.7 | 228.5 |

The SFDP now covers nine per cent of the estimated 1.2 million rural households below the poverty line. Nearly 15 per cent of the groups formed so far are female.

## The Group Organizer

The GO is the key figure in the implementation of the SFDP. It is he who motivates, guides, and assists the small farmers in organizing groups, in operating them, and in formulating viable investment proposals. He acts as a liaison between the groups and various development agencies, at the local level, to make these agencies aware of the needs of the small farmers, and facilitates the supply of inputs and services such as fertilizers, credit, extension advice, veterinary services, and any other services and materials needed by group members.

He sanctions loans to the group, and arranges disbursement. He also impresses upon them the need to economize by cutting down wasteful social expenditure and by giving up undesirable habits such as drinking and gambling. He also helps the small farmers on any other matter about which they may call upon him for assistance. In short, the GO is the 'friend, philosopher, and guide' of the small farmers. The success of the programme largely depends upon his ability, motivation, and resourcefulness.

The GOs are selected mostly from among existing officials working in the Bank. They are given three months' intensive training, both in the classroom and in the field, before their assignment. They are also attached to an SPO for three months to enable them to acquire a first-hand knowledge of the working of the SFDP. Topics of training include: the SFDP concept and operations, group dynamics, household survey techniques, credit policies and procedures, preparation of investment plans, analyses of loans and repayment capacities, and farmers' training procedures.

## Loan Operations

When a group is formed and has formulated its plans, it applies to the SPO for loans to implement these plans. Since the GO has the authority to sanction practically all the loans needed by individuals and groups, the farmers are spared the long, tedious, and time-consuming formalities that a bank loan normally involves, and they receive the loans promptly.

Loans are provided on a group guarantee basis even though most of the economic activities are undertaken on an individual basis. Loans are also provided for group and inter-group activities. Purposes for which loans may be granted are crop production, irrigation, livestock, agricultural mechanization, horticulture, appropriate technological measures (e.g., *gobar* gas plants and water turbines), cottage industries, agro-industries, agricultural marketing, small businesses, limited household consumption, afforestation and fodder planting, and purchase of land and construction of houses for the landless. The terms of the loans are fixed according to the estimated returns from the investments and the capacity of the farmer to repay. Normally, loans are extended only to the members of those groups that have not defaulted on repayments. The GO may, however, on the recommendation of the group, sanction new loans to defaulting members if he is convinced that a valid reason exists for default and that the new loans will enable them to repay the old as well as the new loans on time (ADB/N 1986). The maximum amount of loans available to a small farmer is Rs 30,000. Interest rates on the loans are the same as those charged to other farmers, but small farmers are given considerable interest rate and capital subsidies on irrigation loans. Collateral is not essential but is taken from those who have property.

Loans disbursed to small farmers for various income-generating activities during 1988/89 amounted to Rs 203 million, with an average amount of Rs 2,000 per member (Table 28.2). During the earlier years of the SFDP, the bulk of the loans went to livestock raising, but its share in the total loans has declined during recent years (Table 28.3). Livestock, crop production, and farm mechanization (which includes bullocks), in that order, claim the largest share of the total loans. Recovery rates were around 60 per cent until 1986/87, but dropped to 47.4 per cent in 1987/88, to rise again to 51.8 per cent in 1988/89 (Table 28.2). These rates, low as they are, are still better than the repayment rates of the non-SFDP loans of the ADB/N. Recovery rates by the purpose for loans are given in Table 28.4. Livestock loans have the largest overdue amounts.

## Training of Small Farmers

The training of small farmers is an important component in the success of the SFDP. The training programmes address the need to upgrade the skills of the small farmers with a view to increasing their farm production and incomes. Five regional training centres have been established in the five regions of the country for this purpose. Practical training is given in subjects such as crop production, vegetable farming, livestock management, veterinary care, poultry farming, bee-keeping, sericulture, horticulture, maintenance of agricultural equipment, weaving, handloom operation, sewing, bamboo furniture, and bag-making. Farmers are also trained in the group concepts, group functioning, group savings, and record keeping. This training is expected to help the farmers to use their

**Table 28.2. Growth in loan disbursement, loan collection, loans outstanding, loans overdue, and loan recovery rates under SFDP**

(in thousands of rupees)

| Year | Total members | Loan | | Loan collection amount | Loan outstanding | | Overdue loans | | Recovery rates (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | Total amount | Per member | | Total amount | Per member | Total amount | Per member | |
| 1975/76 | 443 | 453 | 1.02 | 9 | 444 | 1.00 | — | — | — |
| 1976/77 | 1,443 | 1,120 | 0.78 | 124 | 1,440 | 1.00 | — | — | — |
| 1977/78 | 3,205 | 2,515 | 0.78 | 624 | 3,331 | 1.04 | 137 | 0.04 | 82.0 |
| 1978/79 | 5,121 | 3,357 | 0.66 | 1,189 | 5,499 | 1.07 | 874 | 0.17 | 57.6 |
| 1979/80 | 6,623 | 3,865 | 0.58 | 1,566 | 7,798 | 1.18 | 546 | 0.08 | 74.1 |
| 1980/81 | 7,974 | 4,953 | 0.62 | 2,548 | 10,203 | 1.28 | 2,714 | 0.34 | 48.4 |
| 1981/82 | 12,831 | 12,467 | 0.97 | 3,460 | 19,210 | 1.50 | 4,053 | 0.32 | 46.1 |
| 1982/83 | 21,319 | 25,580 | 1.20 | 6,879 | 37,911 | 1.78 | 4,943 | 0.23 | 58.2 |
| 1983/84 | 29,552 | 42,469 | 1.44 | 14,914 | 65,466 | 2.21 | 8,865 | 0.30 | 62.7 |
| 1984/85 | 41,603 | 70,363 | 1.69 | 25,284 | 110,545 | 2.66 | 19,745 | 0.47 | 56.2 |
| 1985/86 | 52,864 | 96,718 | 1.83 | 40,376 | 166,518 | 3.15 | 31,399 | 0.59 | 56.2 |
| 1986/87 | 63,112 | 99,880 | 1.58 | 51,292 | 222,509 | 3.53 | 28,027 | 0.44 | 64.7 |
| 1987/88 | 78,518 | 149,866 | 1.91 | 75,268 | 299,884 | 3.82 | 83,628 | 1.07 | 47.4 |
| 1988/89 | 95,968 | 202,819 | 2.11 | 104,640 | 402,249 | 4.19 | 97,443 | 1.02 | 51.8 |

*Source*: Agricultural Development Bank of Nepal.

loans better. Members of the women's groups receive training mostly in sewing, weaving, knitting, handicrafts, vegetable farming, and the raising of small animals. Training needs within an SPO are assessed on the basis of requests received from the GOs concerned and finalized in consultation with the officials concerned of the ADB/N. Trainees are paid daily or monthly allowances during the training period, which can last from three days to three months. The cost of training varies from Rs 100 to Rs 4,000 per trainee.

A large number of farmers have been trained in the Regional Training Centres (see table).

| Year | No. of training courses organized | No. of farmers trained |
|---|---|---|
| 1984/85 | 109 | 1,221 |
| 1985/86 | 189 | 4,208 |
| 1986/87 | 275 | 7,615 |
| 1987/88 | 179 | 3,425 |
| Total | 752 | 16,469 |

## Group Savings Scheme

One important instrument of self-reliance, initiated under the SFDP, is the institution of group savings. Members of a group make monthly contributions to a group savings fund on an agreed basis according to their capacity to save. Group savings can be used in financing individual and group projects, but most often they are used for lending to individual members to enable them to tide over exigencies arising from illness or death, loss

**Table 28.3. Loan investment in SFDP by purpose and year**

(in thousands of rupees)

| Year | Crops | Live-stock | Farm mech. | Irri-gation | Agro & cottage industries | Horti-culture | Others | Total |
|---|---|---|---|---|---|---|---|---|
| 1975/76 | 19 | 261 | 163 | 9 | 0 | 1 | 0 | 453 |
| | (4.19) | (57.62) | (35.98) | (1.99) | 0.00 | (0.22) | 0.00 | (100.00) |
| 1976/77 | 86 | 561 | 358 | 33 | 21 | 0 | 61 | 1,120 |
| | (7.68) | (50.09) | (31.96) | (2.95) | (1.88) | 0.00 | (5.45) | (100.00) |
| 1977/78 | 385 | 1,392 | 365 | 118 | 117 | 62 | 76 | 2,515 |
| | (15.31) | (55.35) | (14.51) | (4.69) | (4.65) | (2.47) | (100.00) | (100.00) |
| 1978/79 | 369 | 1,579 | 549 | 331 | 227 | 47 | 257 | 2,257 |
| | (10.99) | (47.04) | (16.35) | (9.86) | (6.76) | (1.40) | (7.66) | (100.00) |
| 1979/80 | 458 | 1,728 | 752 | 344 | 157 | 143 | 243 | 3,865 |
| | (11.85) | (44.71) | (19.46) | (8.90) | (4.06) | (3.70) | (6.29) | (100.00) |
| 1980/81 | 674 | 2,365 | 1,068 | 111 | 274 | 226 | 235 | 4,953 |
| | (13.61) | (47.75) | (21.56) | (2.24) | (5.53) | (4.56) | (4.74) | (100.00) |
| 1981/82 | 198 | 5,995 | 2,940 | 0 | 873 | 273 | 399 | 12,467 |
| | (1.59) | (48.09) | (23.58) | 0.00 | (7.00) | (2.19) | (3.20) | (100.00) |
| 1982/83 | 4,595 | 12,391 | 3,677 | 1,556 | 2,176 | 455 | 730 | 25,580 |
| | (20.64) | (48.44) | (14.37) | (6.08) | (8.51) | (1.78) | (2.85) | (100.00) |
| 1983/84 | 8,764 | 18,587 | 6,493 | 2,173 | 3,682 | 841 | 1,929 | 42,469 |
| | (20.64) | (43.77) | (15.29) | (5.12) | (8.67) | (1.98) | (4.54) | (100.00) |
| 1984/85 | 14,489 | 30,323 | 9,291 | 3,824 | 6,725 | 1,829 | 3,882 | 70,363 |
| | (20.59) | (43.10) | (13.20) | (5.43) | (9.59) | (2.60) | (5.52) | (100.00) |
| 1985/86 | 20,071 | 69,733 | 13,621 | 5,961 | 7,242 | 2,524 | 7,566 | 96,718 |
| | (20.75) | (72.10) | (14.08) | (6.61) | (7.49) | (2.61) | (7.82) | (100.00) |
| 1986/87 | 23,548 | 40,733 | 1,227 | 5,602 | 6,786 | 3,289 | 7,572 | 99,880 |
| | (23.58) | (40.78) | (1.23) | (5.61) | (6.79) | (3.29) | (7.58) | (100.00) |
| 1987/88 | 39,980 | 57,398 | 17,379 | 7,777 | 10,587 | 5,412 | 11,664 | 150197 |
| | (26.62) | (38.22) | (11.57) | (5.18) | (7.05) | (3.60) | (7.77) | (100.00) |

Note: Figures in parentheses indicate the row percentages.

*Source*: SFDP Division, Agricultural Development Bank of Nepal.

of assets, natural calamities, social expenditures, and other unforeseen expenditure. More than Rs 10 million have so far been collected as group savings under the SFDP. Group savings have exceeded Rs 100,000 in a number of SPOs. This has contributed significantly to the development of a sense of self-reliance and self-confidence among the members.

## Social Services

Social development activities are important components of the SFDP. These activities, which enhance the economic and social well-being of the farmers, include the promotion of adult and female literacy, health care for women and children, population education and

**Table 28.4. Purposewise loan disbursements and recovery rates in SFDP (1988/89)**

(in thousands of rupees)

| Purpose | Investment | Collection | Overdue | Recovery Rate % |
|---|---|---|---|---|
| Cereal crops | 33,214 | 21,595 | 12,972 | 62.5 |
| Cash crops | 24,845 | 14,384 | 10,342 | 58.2 |
| Marketing | 12,820 | 8,320 | 5,151 | 38.2 |
| Farm mechanization | 23,042 | 11,217 | 14,433 | 43.7 |
| Irrigation | 13,737 | 5,613 | 4,811 | 53.8 |
| Bio-gas | 831 | 210 | 389 | 35.6 |
| Land development | 4,343 | 1,071 | 1,039 | 50.8 |
| Agro-industries | 11,835 | 6,675 | 7,293 | 47.8 |
| Godown and cold storage | 134 | 121 | 47 | 72.0 |
| Livestock | 62,767 | 34,520 | 40,303 | 46.1 |
| Horticulture | 7,543 | 899 | 635 | 58.6 |
| Tea and coffee | 66 | 15 | 28 | 34.8 |

Note: The figures given are provisional.

*Source*: Asian Development Bank, Progress Report of SFDP for 1988/89.

family planning, supply of drinking water, promotion of improved stoves, sanitation, and construction of school buildings. Women's development activities are also undertaken in at least 63 SPOs where women GOs have been appointed. These activities include various income-generating activities carried out exclusively by women.

## Coordination with Other Agencies

Being a multidisciplinary integrated development programme, the SFDP has to depend for its success upon cooperation from relevant government line agencies. Important among these agencies are:

- the Ministry of Local Development—social service;
- the Department of Agriculture—agricultural extension services;
- the Department of Livestock Development and Animal Health—veterinary services, breeding, etc;
- the Department of Cottage and Village Industries—training and technical assistance in the cottage industries component;
- the Agricultural Inputs Corporation—supply of chemical fertilizers and improved seeds;
- the Department of Forests—supply of seedlings, technical advice regarding forestry; and
- the Dairy Development Corporation—marketing of dairy products.

Cooperation with these agencies is achieved through coordination committees at the central and district levels, formed under the Chairmanship of the Governor of Nepal Rastra Bank and the Chief District Officer, respectively.

### Financing Agencies

The planning and implementation of the SFDP, during its initial experimental stage, was undertaken with the financial assistance of the Food and Agriculture Organization/United Nations Development Programme in 1975. The International Fund for Agricultural Development (IFAD) came forward with the first major financing of the programme ($12.5 million concessional loan and $1 million grant) in 1981. IFAD also financed a second SFDP loan ($26.5 million) in 1985. A total of 227 SPOs have been financed by the IFAD under SFDP I and II. The remaining SPOs have been financed by various other donor agencies under integrated rural development projects—Koshi Hill Area Rural Development Project (British), High Area Development Project (ADB), Rapti (USAID), and Karnali/Bheri Integrated Rural Development (Canadian International Development Agency). In addition, UNICEF, UNFPA, and the German Technical Assistance Programme are financing various social service and training components. IFAD is financing another project for the development of household forestry and forage and livestock in the hills, through the SFDP framework.

Another major project, SFDP III, is being negotiated with the Asian Development Bank.

### The Viability of SFDP

The SFDP, being more or less a community development programme, has high overhead costs and this makes it costlier than a normal credit programme. Administrative costs of the SFDP in 1987/88 were calculated to be quite high (11.8% by the Feasibility Study of SFDP III). This explains why the SFDP accounted for 23.65 per cent of the total administrative costs of the ADB/N, even though SFDP loans were only 13.8 per cent of the total outstanding loans of the ADB/N (IDS 1989a). An analysis of the profit and loss of the SFDP, as calculated by the Feasibility Study, reveals that 'the viability of the SFDP operations is dependent upon the availability of funds at very low rates of interest, and not at the present rates of mobilising domestic funds by the banks'.

It is often argued that the overhead costs of the SFDP can be reduced by increasing the number of groups and members and the volume of loans per SPO. This will, however, involve a trade-off between reducing costs and reducing effectiveness of the programme. Financial viability should not be a decisive factor in judging the effectiveness of SFDP because of its contribution to social development and poverty alleviation, a declared goal of the government.

## GENERAL IMPACT OF THE SFDP

The SFDP is considered to be one of the very few successful and promising programmes undertaken for poverty alleviation in the country, in spite of the various problems that have beset it during the last few years. It was the first time that the disadvantaged and the poorest, who had no collateral to offer, gained access to institutional credit. 'It has resulted in significant improvements in the social and economic welfare of the rural poor, and holds greater promise for the future' (IDS 1989b). The programme has demonstrated that it is possible to reach the poor, to organize them, and to motivate them for higher

performance. A special follow-up mission, fielded by IFAD in 1989, felt that 'despite the problems affecting the project there is no doubt that it has been, and continues to be successful. It is generally regarded as the only project addressing the needs of the rural poor'. Encouraged by the relatively successful operation of the SFDP, many donor agencies have channeled their activities through small farmer groups.

The most recent evaluation of the SFDP, based on field surveys, was carried out by APROSC in 1987. Among earlier evaluations are the one undertaken by APROSC in 1978 and another carried out by Nepal Rastra Bank in 1980. All three evaluations point to the positive impact of the SFDP. Other evaluations at the micro-level have come out with similar findings.

The 1987 APROSC evaluation, the most comprehensive evaluation so far, is based on the field surveys of six SPOs in the mountains and six in the *Terai*, covering a total sample of 576 households. Notwithstanding some methodological deficiencies of the study, its findings are not considered to be wide of the mark. Some of the findings are listed below.

- The percentage of farmers using improved seeds has increased from 37 per cent to 62 per cent in the hills.
- The amount of fertilizers used went up by 49 per cent.
- Yields of major crops have increased appreciably.
- The number of fodder trees per livestock unit increased.
- The number of milch animals owned by small farmers and the volume of milk produced also increased.
- Savings per member increased substantially.

All this has resulted in significant increases in the total family income of the small farmers covered by the SFDP. The average farm income of the beneficiary households in the hills increased by Rs 1,637 per household, or by 4.7 per cent per year, while off-farm income, constituting 35 to 45 per cent of the total household income, rose by 11.9 per cent per year in the mountains and 16.14 per cent in the *Terai*. Income distribution within the households is also considered to have altered in favour of women through their income-generating activities under the programme (IFAD 1989). A study on employment generation came out with the finding that underemployment in the surveyed areas declined from 48.3 per cent to 24.6 per cent after project implementation (APROSC 1989).

Observations of the IFAD mission for completion evaluation (1989) and the IDS feasibility study of SFDP III (1989) saw real improvements in productivity, in the living standards, and in a heightened social awareness among small farmers. They had become conscious of the new opportunities offered to them by the SFDP and were showing genuine interest in seizing these opportunities. They had also begun using improved inputs, improved cultural practices, and integrated farming systems (IDS 1989b). Some of the small farmers with less than one hectare of rainfed land or less than half a hectare of irrigated land were found to be making sufficient income to meet their basic needs by combining crop production with livestock, poultry, and horticulture. On the social front, significant progress had occurred in the percentage of children enrolled in schools. Drinking water supplies had improved. More women, in areas covered by the programme, were using family planning methods. Over 50 per cent of the women surveyed thought that their social recognition and prestige had been enhanced because of the programme

(CWD 1986). In many communities, member farmers had given up gambling and drinking and had agreed to curtail expenditure on social ceremonies and festivals (ADB 1989).

The most notable achievement of the SFDP, however, is the creation of an institutional base for organizing the rural poor into groups with the purpose of demanding, receiving, and using credit and other services offered by government development agencies more effectively. It has also developed a sizeable cadre of experienced, capable, and innovative field workers prepared to work and live with the farmers and expose them to new ideas in various fields.

The main factors leading to the success of the SFDP are considered to be:

- the organization of small farmers into groups with a view to developing feelings of group solidarity among them,
- the level of personal attention given by the GOs and other SPO staff to motivate and help the small farmers, and
- the delivery of credit to the doorstep of the small farmer.

Notwithstanding all its successes, the programme has, during its rapid expansion, developed many weaknesses, some of them quite serious. What is needed now is an in-depth examination of the programme to find out the causes underlying these weaknesses and to rectify them. Some problems are noticeable in the conceptual aspects of the SFDP also. These too have to be addressed without much delay.

## SOME WEAKNESSES IN THE PROGRAMME

As a credit programme, the most glaring shortcoming observed in the SFDP is the very low repayment rate of 51.2 per cent. This directly affects its viability and is the result of several other weaknesses in implementation. Repayment rates show a declining trend with the ageing of the SPOs. Repayment performances of the older SPOs are the lowest, according to an analysis carried out by the ADB/N. Average repayment rates of SPOs that have been in existence for less than three years are 75 per cent, while those from SPOs that have been in existence for 10 years or more are only 39 per cent. Overdue loans are also concentrated in a few SPOs. In the mountains, 6 out of 222 SPOs account for more than 26 per cent of the overdue amount, while in the *Terai*, 4 out of 124 SPOs account for 28 per cent of the overdue amounts. A variety of reasons are considered to have contributed to the low repayment rates. Many of these reinforce each other. Some of them are described below.

Some of the surveys suggest that the eligibility criteria laid down for the selection of small farmers may not always have been met. Cohesion and identity of interests are found lacking in many of the groups. Besides ethnic and occupational diversities, many of the groups have wide disparities in the incomes of their members. All these have resulted in a weakening of the group responsibility for repayments. The concept of group responsibility has also not been enforced uniformly by all the GOs.

The SFDP is a programme requiring intensive supervision and monitoring. It necessitates not only supervision of the groups and its members by the GO but also supervision of GOs by control offices. Adequate supervision appears to be lacking at both levels. The number of groups within a large number of SPOs has expanded beyond the limits of effective supervision. ADBN's policy of increasing the number of groups per SPO, it appears, is aimed at reducing the overhead costs and enhancing the cost-effectiveness of

the programme. However, it involves an important trade-off, as recovery rates appear to decline with an increase in the number of groups in an SPO, as seen from the following table.

| Regions | Average number of groups in SPOs having | | |
|---|---|---|---|
| | 70% | 80% | 90% |
| Mountains | 19 (88 ) | 16 (66) | 13 (41) |
| *Terai* | 26 (38 ) | 19 (31) | 16 (18) |
| Total | 21 (126) | 17 (97) | 14 (59) |

Note: Figures in parentheses indicate the number of SPOs.

It would be desirable to take this consideration into account in determining the limits of effective supervision by an SPO. Advantages gained from increasing the number of groups and the amount of loans per SPO may be more than offset by higher delinquency in repayments.

The training of GOs has lagged behind the fast rate of expansion of the SPOs. A number of GOs who had not been given pre-assignment training felt that they had not been receiving adequate guidance from above and that they had been left to their own devices in search of ways to achieve the objectives of the programme.

The training of beneficiary farmers has considerable scope for improvement, and a suitable system of assessing training needs has yet to be developed. In the absence of such a system, it is not certain whether existing training programmes are adequate or geared to the farmer's need.

A lack of government commitment has resulted in various line agencies not focussing their efforts on the small and marginal farmers. Among other things unavailability of services and inputs during crucial times may have contributed to the increasing amount of overdue loans. Coordination mechanisms set up under the programme have not worked effectively. What little coordination exists at the local level is largely a result of the personal efforts of GOs and other conscientious officials of the line agencies, and not a consequence of government policy.

## SFDP FROM THE MOUNTAIN PERSPECTIVE

Since the SFDP is a programme aimed mainly at marginal farmers and other rural poor found both in the mountains and the *Terai*, it addresses one of the mountain specificities, namely, marginality. Other characteristics of the mountain areas also appear to have been taken into account in the implementation of the SFDP. There are less SPOs in the mountains than in the *Terai* mainly because of the difficulties of supervising a larger number of groups owing to relative inaccessibility within the mountain regions. The average number of groups in a mountain SPO is 21.5, in comparison to a much higher number of 36.1 in the *Terai*. The policy of approving loans without collateral is also appropriate for the mountains where a large number of the poor have no collateral to offer.

Certain programmes actively promoted by the SFDP are also particularly suited to the mountain areas. One example, is the promotion of sprinkler irrigation which, besides

economizing on the use of water, does not tie up scarce land resources in bunds and channels that are needed in regular surface irrigation. Also, sprinkler irrigation carries no risk of soil erosion as do other gravity schemes in the mountains. So far, 2,000 sprinklers, irrigating approximately 600 ha of land, have been financed. Small farmers in the mountains find it viable to use sprinklers because of the high capital subsidy given to irrigation. Similarly, 600 mechanical water turbines have been installed to harness locally available energy sources. These turbines supply energy to a large number of agro-processing units scattered throughout the mountains. Nearly 70 turbines have also been installed for generating electricity. ADB/N is planning to install more turbines in mountain areas where sites are suitable not only to provide power for agro-processing units but also for cottage industries and even for domestic cooking.

There is a need to develop a sound land use policy in the mountains, not only because of the limited availability of agricultural land but also because of the need to protect the environment from further deterioration. Such a policy will necessitate, first, massive reforestation efforts and, second, the optimal use of available agricultural land. Small farmers' groups can be used to achieve both of these. A project for the development of forage, forestry, and livestock, enlisting the efforts of small farmers for reforestation, and, at the same time, providing them with employment and income opportunities, may soon be initiated with assistance from IFAD. Under the project, degraded forest lands will be given to landless and marginal farmers on a long-term lease of 50 years. They will be provided with loans for growing fodder, fuel, and fruit trees on such lands. When the fodder grass and trees begin yielding harvests, the farmers will also be given loans for livestock raising. The project will thus serve the twin purpose of protecting the environment and providing income to farmers through the sale of livestock and its products.

The second need, that of making optimal use of agricultural land, will necessitate the development of agricultural technology packages suited not only to the mountain areas but also to the economic condition of small farmers living there. Such a technology will have to be based on: (1) the least possible use of external inputs (not only because their timely supply cannot be guaranteed owing to the factor of inaccessibility but also because marginal farmers may not be able to afford them) and (2) the whole farming systems approach suited to different types of land in the mountains. Sustained success of the SFDP over the longer term is contingent upon the development and propagation of such technology.

There is also a need to promote non-farm employment as a means of reaching the poor in the mountains. Non-farm incomes are estimated to constitute, at present, approximately 33 per cent of the total income of the mountain regions of Nepal. This percentage is expected to be much higher for small farmers in view of their miniscule landholdings. Off-farm activities will have to be a major source of income for them. Traditionally, cottage industry activities such as utensil making, tool making, shoe making, and tailoring have been carried out mostly by people belonging to lower castes for whom poverty seems to be most concentrated. They have traditional skills in these areas, but their trades have languished for want of adequate financial and market support. There is substantial scope for reviving such crafts and turning such households into independent producers of different commodities that are in demand. Financial, technical, and training support

for such occupational groups in the hills can contribute significantly in the alleviation of poverty and the development of self-reliance in these areas.

It has already been mentioned earlier that livestock still claims the largest share of SFDP loans. This component, however, has one of the lowest repayment rates. The basic flaw is that while large amounts of loans were given for livestock, the need for development of fodder to support the livestock was overlooked. The availability of animal feed in Nepal at present is much less than its demand, considering the sources of its supply, namely, agricultural land, pastures, forest land, shrubland, and plantation areas. It would be desirable in the future to ascertain the availability of fodder before livestock loans are sanctioned. In the hills, loans for small animals such as goats and sheep, and poultry, for small and stall-reared animals such as pigs, rabbits, and young buffalo heifers and for fodder development could be supported with advantage.

## THE NEED TO STRENGTHEN THE SFDP

The SFDP has now completed 15 years of operation. It has made significant strides during this period. Its potential as a poverty alleviation programme is no longer in doubt, even though some serious shortcomings in the programme have come to the surface. It is time that fundamental issues relating to the programme be reviewed carefully and that appropriate corrections be made with a view to putting it firmly on the road to achieving its real objectives. Some of the problems have already been mentioned earlier. Some conceptual issues will now be discussed briefly.

The nature of motivational activities carried out under the SFDP, limits the pace of its expansion within an SPO. The process of inducing changes in the outlook and behaviour of the poorest and the most backward members of the community is bound to be slow. Persistence in efforts and patience in waiting for results are needed. A target-driven approach to the implementation of the SFDP appears to have created a pressure on the GOs to regard lending as an end in itself, rather than as a means, and to lose sight of the real objectives of the programme. It is important that the GOs should basically play the role of catalysts, rather than that of target-achieving implementors.

For these reasons, it may be appropriate to consider SFDP more as a process than a programme or a project, in which achievements of targets, in terms of numbers, is the most important objective. Instead, it should concentrate on its real goals of self-sustained and self-reliant development of the poor. Efforts for achieving this goal have, however, not been adequate. More than 40 SPOs have existed for more than a decade but many of them, instead of achieving self-reliance, have moved away from it, accumulating heavy amounts of overdue loans. Urgent steps are needed to give the programme a new conceptual orientation to help it achieve the goal of self-reliance among small farmers. The dependence of small farmers on SPOs will have to be gradually reduced and phased out. One way of doing this would be to replace SPOs, within a period of time, by small-farmers' associations which could include several small-farmer groups in a contiguous geographical area. Such associations should be responsible for the disbursement and collection of loans, supply of technical services through lead farmers, supply of inputs, marketing of outputs, and mobilization of savings. The role of the bank will then be confined to monitoring the activities of these associations, helping and advising them in their work, and providing them with credit funds. Such funds should be given at rates

of interest which should allow these associations sufficient margin to cover the cost of lending to their members, and thus make them viable units. The replaced SPOs could then move on to other adjoining areas, and thus accelerate the expansion of the programme.

On the planning and implementation side, the SFDP should adopt the system of rolling work plans, under which a plan for the next three years should be prepared every year, based on actual performance during the preceding year. Such rolling plans should enable ADB/N to plan and adjust its activities on a more realistic level and not on the basis of predetermined and rapid targets extending over a five-year period.

Serious and urgent efforts are needed to correct the weaknesses that have crept into the SFDP and to put it on the desired course. Among all existing government programmes, the SFDP remains a programme that holds the highest promise for poverty alleviation.

## LESSONS FROM THE SFDP EXPERIENCE

This brings us to the lessons that can be drawn from the SFDP experience, not only for the development of the mountain region but also for the upliftment of the poor who live in these regions. Some of the lessons appear to be as follows.

Groups have proved to be effective instruments in engendering a sense of responsibility among group members for making collective efforts for common well-being. The question is what kind of group would be most suitable for promoting internal efforts for change rather than a heavy dependence on extraneous factors for change. The villages have long been functioning as cohesive social and economic units in the past, and may well continue to do so in the future. And this factor should not be ignored in deciding about the kind of groups necessary if they are to become effective as instruments of change. Considered from this perspective, the formation of groups representing the whole village, rather than the people belonging to a particular economic level in the village, may be more appropriate for inducing changes in the village. The factor uniting the different members of such a group would be a sense of belonging to the village, which has probably been functioning as an organic unit for hundreds of years. Such groups will be much larger than the present average group of approximately eight members, and may generally consist of 30 to 60 members or even more. Large farmers who do not blend with the economic and social milieu of the village can be excluded from the groups. Within such large groups, efforts should be concentrated on the poorest members, although other members should not be ignored. This approach has been tried in one of the grassroots development programmes in Nepal and found to be effective.

The SFDP experience also underscores an urgent need to develop technologies that are suited to the needs and limitations of the marginal farmers in the mountains and that are acceptable to them. Such technologies should be based, first, on the least possible dependence on external inputs; second, on maximizing the productivity of land, which is the most scarce resource in the mountains; and third, on the need for conserving resources and protecting the environment. There is also a need to train small farmers in such technologies on a massive scale.

In the non-farm sector, there is a need to upgrade the traditional skills of the occupational groups and craftsmen who have been practising their trade for generations, with a view to making their products more competitive. Such efforts should also be supported by financial and marketing assistance.

The SFDP has also demonstrated the need to make the process of development in the villages self-sustaining and not overly dependent on assistance from extraneous sources. Initial interventions by catalysts, such as the GOs, are necessary. The main role of such catalysts should, however, be to create institutions that reduce the need for external assistance and ultimately eliminate the need for their own services. Such institutions could be in the form of local organizations and associations which, while striving for the welfare of their members, could also serve as conduits for the supply of government services to individual members of the village, not only in the fields of agriculture and cottage industries but also in social services such as adult literacy, primary health care, family planning, and drinking water. All government agencies will then need to deal with these organizations and not with individual members in the villages.

Finally, no 'cut-and-dried' strategy for the upliftment of the poor in mountain areas has yet been developed. A search for such a strategy will necessarily have to follow a process of trial and error. Presently, efforts are being made in this direction by several government and non-government agencies in their own way. The results of all such efforts should be carefully studied, evaluated, and disseminated in a quest for appropriate strategies.

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# THE AGA KHAN RURAL SUPPORT PROGRAMME: AN APPROACH TO VILLAGE MANAGEMENT SYSTEMS IN NORTHERN PAKISTAN

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## CONTENTS

## INTRODUCTION

The overall objective of this paper is to explore those issues in community organization and resource management that represent the common concerns of the International Centre for Integrated Mountain Development (ICIMOD) and the Aga Khan Rural Support Programme (AKRSP). These concerns are related to the design and implementation of rural development programmes. They are motivated, in the case of AKRSP, by a desire to develop a model for high-mountain development in Northern Pakistan that can enable the people of the region to improve their incomes in a sustainable and equitable manner. ICIMOD's motivation is to acquire lessons for the future by comparing the rich and diverse experiences in rural development in the Hindu Kush-Himalayan region.

ICIMOD and AKRSP share the following broad perspectives:

- that sustainable productivity and sound environmental management are long-term goals of rural development;
- that particular attention needs to be paid to organizational structures at the project and community levels, in addition to the attention that is normally paid to technical and financial constraints; and
- that organizational resources are needed to facilitate implementation and enhance local participation in rural development programmes.

These perspectives have been the basis for collaborative work between AKRSP and ICIMOD since 1985. A pilot study on the interrelationship of community management of rural resources, with accelerated development efforts, conducted in the project area of AKRSP, has been one of the major collaborative activities of the two organizations (Husain et al. 1990). This paper draws on the results and understanding generated by the above study. The paper first introduces AKRSP and its approach as well as its mandate area, namely, Gilgit District, with focus on its natural resource base and the institutional framework affecting resource management. The second part of the paper presents village-level evidence on the management of natural resources as revealed by the case studies carried out in nine villages. The third section presents conclusions and general inferences from the case studies to reflect on the AKRSP model of institutional innovations.

## INTRODUCTION TO GILGIT DISTRICT AND AKRSP

### Introduction to Gilgit District

The project area of AKRSP consists of the three northernmost districts of Pakistan—Gilgit, Chitral, and Baltistan—situated between longitudes 71°2′E and 75°4′E and latitudes 35°3′N and 35°6′N; the region borders on India, China, and Afghanistan. The area covers 69,200 sq. km and has an estimated population of 830,000, scattered over 1,030 villages (AKRSP 1987b). The region is extremely mountainous, since it is at the intersection of four of the world's highest mountain ranges—the Himalaya, the Karakorams, the Pamirs, and the Hindu Kush. Within this region, Gilgit District is the most privileged, in terms of accessibility and overall development. Its area is 28,500 sq. km with an estimated population of 286,000 living in more than 300 villages. There are some 30,000 farm families in Gilgit District and an urban population of about 40,000 (AKRSP 1987b).

The physiography of the region is rugged and hilly, with steep, heavily dissected

slopes and water courses along the slope faces and valley bottoms. The terrain is naturally unstable and rockfalls and landslides are common occurrences. The soil is mixed with stones and boulders, and the depth, aspect, and location of seepage areas have more influence on production potential than the variation in the parent material. These soils are low in clay content, and, due to extreme dryness, are very low in organic content. They are, however, suitable for a large number of annual and perennial crops.

The region lies just outside the monsoon area in a partial rain shadow. It receives about 100–900 mm of rain annually, mainly as snow in the winter months. Agricultural production is sustained by irrigation with the glacial melt. The region can be best described as having an arid, continental-type climate. The growing period at 1,500 masl is estimated to be 325 days, and at 3,000 masl it is 195 days (AKRSP 1987b). The nine villages selected for this study fall within this range.

The district is connected to the rest of Pakistan, and to China, via the all-weather Karakoram Highway (KKH), which was formally inaugurated in 1978. There are scheduled daily flights between Gilgit and Islamabad, 600 km away by road.

Agriculture is by far the largest economic activity in Gilgit District and is the principal means of livelihood of 85–90 per cent of the population (detailed descriptions of the region's agriculture are given by Staley 1982, Saunders 1983, and Whiteman 1985.) The region supports a range of farming systems, but nearly all contain common elements: cereals, grain, legumes, fodder crops, small livestock, fruit and nut trees, vegetable crops, and fuel trees. Broadly, all the farming systems in the region can be described as arable crop systems with trees and livestock. Indeed, farming in the region shows many of the symptoms of transition from a subsistence economy to a semi-commercial economy. The following picture of Gilgit's traditional agriculture by an agronomist (Whiteman 1986) describes the farm household and its resources succinctly:

> A typical village will contain about 60 households with an average family size of eight people and an irrigated area of 0.75–1.0 hectares in double-cropped areas (up to about 2,000 m altitude) and 1.5 to 2.0 hectares in the single-cropped area. Wheat is the dominant crop; maize became popular some 55 years ago and has largely replaced the earlier-maturing Panicum and Setaria millets and buckwheat that now persist only at the upper end of the double-cropping zone. Up to a quarter of the land may be under fodder crops, mostly lucerne for hay for winter use and shaftal clover for green cutting in spring. Pulses are rarely grown, and a small area is allocated for vegetables and potatoes. The area is deficient in grain and up to a third of the wheat that is consumed is from a subsidised quota. Yet in spite of the shortage of land for cereals, a range of multipurpose trees for fodder, fuel, timber, and fruit are grown along field boundaries around the house and on any steep but irrigable land. Poplar, willow, mulberry, apricot, and Russian olive (Eleagnus) are the most common, with walnut, peach, grape, apple, almond, pear, fig, and pomegranate widespread. There will be a pair of oxen, one or two cows, a calf, perhaps 20 goats, 10 sheep, 15 hens, and a donkey.
>
> About 1,500 metres higher there is a sparse communally grazed alpine pasture about two days' walk away where the livestock are taken for a four-month period in summer. Farther up the mountain, in small side valleys, are stunted, gnarled remains of open juniper forest with a little birch heavily overcut and

grazed that provides the firewood for cooking. Between the village and the mountain pasture is often a small meadow or barley field wherever the valley becomes wide enough.

This little scenario depicts the total resources available to meet all family needs for house construction material, food, furnishings, woollen garments, dairy products, livestock fodder, and farm implements as well as cash for small sundries (paraffin, tea, matches, salt), though these are more often bartered for. Nowadays most households have a male member working part-time or full-time outside the area as a source of cash. Despite the material poverty and frugal life, there is a robust quality apparent in a life lived in equilibrium with an adapted farming system from a consistent resource base.

Changes taking place in rural markets and agricultural technology are affecting the above situation in significant ways. With improved communications, a majority of the district's farmers are now using tractors, threshers, and new varieties of wheat; an even larger proportion use chemical fertilizer. Timber is imported in large quantities from the neighbouring district of Diamer; wheat, rice, dairy products, vegetables, cooking oil, livestock, kerosene, liquefied petroleum gas, cement and construction material, and a number of other items of daily use are now supplied from the plains of Pakistan. Able-bodied men migrate in large numbers within the region, following agricultural, construction, and tourism activities, or they go down-country in winter to work for cash. Increasingly, women are becoming involved in running the farm household in association with old men and children. Small hydroelectric units provide night-time electricity for lighting. New roads connect remote valleys to the KKH. Education is becoming more widespread. The value of time is rising, and labour-intensive activities are increasingly being performed in less labour-intensive ways or else given up. Large amounts of credit are being made available for agricultural development, construction, and commerce. In short, the allocation of resources in Gilgit is being subjected to rapid and pervasive change. After centuries of isolation and low-income equilibrium, the region's rural economy is characterized by constant change and the opportunity to reallocate resources from low pay-off options to high pay-off ones.

## AKRSP: Organization, Objectives, and Approach

The AKRSP was established by the Aga Khan Foundation in 1982 as a private company limited by guarantee. It is a non-profit, non-sectarian Pakistani organization, with its own Board of Directors for policy-making and direction and a management group in the project area (headed by the General Manager) for day-to-day operations.

Although seed money for the AKRSP was (and is) provided by the Aga Khan Foundation, the company has received generous financial assistance over the years from several donor groups and development agencies. Finally, AKRSP has, in a few significant instances, pooled its resources with development funds put at the disposal of elected representatives in Gilgit by the government.

AKRSP started operating in Gilgit in December 1982 and subsequently extended its operations to the districts of Chitral and Baltistan. Its project area now includes followers of three major Islamic traditions in roughly equal proportions. All its staff are Pakistanis, and all the field and support staff are recruited from the project area. AKRSP's

activities now extend to about 800 village organizations (VOs, nearly half of them in Gilgit District) and include programmes for social organization, women–in development, physical infrastructure—particularly for irrigation and communications—agricultural and livestock research, extension input supply, appropriate technology, commercial and industrial development savings and loans, resource management—particularly forestry and pasture development—and training in a wide range of practical and managerial skills. In addition, AKRSP is working with government and private agencies to provide VOs with access to basic health coverage, education, and improved living conditions. Wherever feasible, AKRSP provides services, through existing private or government entities, and works to create effective links between these and the VOs rather than duplicating the work of existing organizations.

AKRSP's Second Phase Strategy Paper describes the programme's objectives in the following words (AKRSP 1987a).

> The broad objective of AKRSP is to increase the capacity of local people to identify and utilise opportunities and to solve their own problems so that they can plan and implement development programmes leading to increased incomes and employment (without significantly increasing inequalities); to improved health, nutrition, education and living conditions; and to improvements in the sustainability and productivity of the environment. Thus AKRSP is designed to promote development in an equitable and sustainable manner. It is also conceived, from the outset, as a self-liquidating organisation, able to work itself out of a job in any location within approximately ten years. The aim is to leave in-place local institutions capable of facilitating further progress into the future.

The basic planning tool for AKRSP is a series of diagnostic dialogues carried out with villagers (AKRSP 1983). The General Manager initiates the first dialogue, explaining the objectives and methods of AKRSP and inviting the villagers to identify a project that could be undertaken and maintained by the villagers for the benefit of the village as a whole.

The second dialogue determines the feasibility of the project under the technical supervision of a competent senior manager. Field operations are managed by the Social Organization Unit and the products of the second dialogue are blueprints and cost estimates for the project.

The third dialogue starts with a discussion of the finalized scheme. The terms of partnership between AKRSP and the villagers are also discussed and AKRSP describes the form and extent of assistance it can provide, and villagers explain how they will plan and implement the scheme, develop skills, meet regularly as a disciplined organization, and establish group savings. If successful, the third dialogue results in a village-level project for the VO.

The key concept in AKRSP's approach is that of the VO—this is a broad-based coalition of all those village residents whose common economic interest is best served by forming a multipurpose development organization. The VO is the executing agency for all village-level projects sponsored by AKRSP and its collaborators. This institution is established, in the first instance, by the promise of a grant (an average Rs 150,000) for a village- level Productive Physical Infrastructure (PPI) Project. Since farmers attach

great importance to improvements in their common physical assets, the investment by AKRSP initiates a process of disciplined organisation and collective management in the village. In turn, the formation of the VO enables the village to complete the PPI project more quickly and cheaply than would be possible otherwise. There is, thus, a symbiotic relationship between the village organization and the grant-funded PPI; each enhances the effectiveness of the other and results in income generation for the villagers. The new social organization (the VO) is aided by the catalytic effect of the new economic infrastructure (the PPI) that the VO is implementing. Together, the VO and the PPI become vehicles and stimulants for local income and employment generation.

During the First Phase (1983–1986), the principal focus of AKRSP was the establishment of village-level institutions for managing development and the funding of essential local, infrastructure projects, one per VO, chosen by the VOs. During the First Phase, both AKRSP and the villagers invested in various types of productive common property on a very large scale. This experience demonstrated the potential for community management of financial resources and physical assets such as irrigation channels, link roads, and reservoirs. Besides contributing to widespread increases in income, the collective management of these resources has helped shape the VOs as institutions for village development.

*Village Organization and Resource Management*

To build upon the experiences of the First Phase, AKRSP's Second Phase strategy lays down the objective of improving the integrated management of resources at three levels—farm, village and valley/watershed. This would include work on farming systems, integrated livestock-cropping-pasture systems at the village level, and contributions to valley planning and watershed management (AKRSP 1987a). The pursuit of this objective is expected to lead to:

- improvements in the productivity and sustainability of natural resources, i.e., greater sustainability of natural resource use together with increases in farm incomes, and
- a greater capacity among the villagers for managing their common resources.

AKRSP's existing programmes have begun to address issues of:

- land use and the development of new land;
- irrigation development and water management;
- forest management and forestry development; and
- livestock and pasture development.

In implementing these programmes, the AKRSP has benefited from collaboration with relevant government agencies, as well as the International Wheat and Maize Improvement Centre (CIMMYT), the International Union for the Conservation of Nature and Natural Resources (IUCN), ICIMOD, the International Institute for Environment and Development, and the International Irrigation Management Institute (IIMI). Collaboration with these agencies is a response to the realization that the development of village management capacity in the future requires 'a growing sophistication in the identification and analysis of opportunities and problems, and in the development of entrepreneurial response and of internal mechanisms of management and control' (AKRSP 1987a).

AKRSP's experience with resource development programmes in the first phase led to the recognition of the amount of women's involvement in, and dependence on, the

region's natural resources. To a varying but increasing degree, rural women are involved in or affected by the management of land, water, forests, pastures, and livestock. In areas where men have been attracted to off-land employment opportunities, it is particularly important to improve the efficiency of the time and management inputs provided by women, in order to equitably improve the productivity and sustainability of natural resources. To this end, AKRSP's work included the sponsorship of the Workshop on Women and Resource Management in Gilgit, in November 1987 (Hussein and Karmali 1987, Magrath 1987).

*World Bank Evaluation of AKRSP's First Phase*

While it is too early to assess the new directions of AKRSP's second phase, the first phase was evaluated by the Operations Evaluation Department of the World Bank, in September 1986. The evaluation report has since been published (World Bank 1987).

The World Bank report concluded that AKRSP's achievements 'are largely attributable to the effectiveness of the institution-building efforts at the village level.' It observed that the management principles that are critical to this effectiveness include:

(1) The principle of the primacy of the VO. The VO is the focal point for all AKRSP activities but its sovereignty is sacrosanct, although AKRSP is firm in keeping to the agreed conditions of the partnership. The VO and AKRSP are seen as contractual partners insofar as activities of the VO are supported but never undercut.
(2) The principle of continued attention to innovations. Villagers and staff of AKRSP alike are encouraged to innovate, using a trial and error approach that is carefully monitored. The effect is to create a 'learning environment' of active improvisation and innovation.

The World Bank report also points out that the 'pursuit of these principles is aided by the flexibility of AKRSP as a small, independent non-government organisation, relatively free of fixed procedures, hierarchical clearance, or internal constraints on actions. This flexibility facilitates the ''working'' method of experimentation, adaptation, and trial and error innovation that is the hallmark of the program.' The following characteristics of the project area appear to have worked to AKRSP's advantage:

(1) institution-building could proceed with little or no competition, in something of a political and administrative vacuum;
(2) a tradition of cooperation in the villages that is consistent with the VO approach; and
(3) the high proportion of Ismaili villages in Gilgit District, favourably disposed to an Aga Khan-supported programme, gave an initial impetus which was invaluable, though only about one-third of the population of the project area is Ismaili.

The World Bank commended the institutional model of AKRSP that combines village organization and PPIs at the village level. At the same time, it found that the 'production model' was less well studied and conceptualized than the 'institutional model' and several changes were recommended in this area. For example:

(1) environmental and resource constraints are a major issue, and, while much is being done, further attention to this issue is needed;
(2) institutional development within and beyond the VO, especially relating to land and water use, warrants support.

The World Bank report summarized its understanding of AKRSP principles in the following list:

(1) Small farmers in isolated communities require a village organization to overcome the disadvantages of everything being on a small scale.
(2) VOs can be used successfully to promote formal savings and credit by individuals and the group, provided that control of the savings and credit remains with the group.
(3) VOs can be employed to promote genuine participation in planning and implementation of rural development.
(4) Villagers can be effectively organized initially around economic, rather than social, sector activities.
(5) A PPI Project is an effective entry point and catalyst for the organisation of villagers.
(6) In order to implement a PPI project efficiently and without exploitation, when village labour is employed it should be paid.
(7) Regular savings, however small, are an essential part of the discipline of collective management and finance of development.
(8) Members of the VO can acquire the necessary organisational and technical skills, for which other villagers are prepared to pay, to serve themselves and their community.
(9) The VO following these principles can take continuing responsibility for sustainable development of the resources at its disposal.

A direct operational implication of these principles is that the VO is the missing link between conservation and development, between income generation from a resource and its sustainable use over time. This can be considered an extension of AKRSP's first phase approach to its second phase concerns with sustainable resource management, particularly the management of change through institutional and technological innovations.

## Institutions, Laws, and Natural Resources in Gilgit

### *The Context of Institutional Change*

Like many Third World communities, Gilgit is subject to the forces of social fragmentation, disintegration of values and institutions, and the alienation of social and economic life from the values, institutions, and resources of rural communities. These forces represent both a constraint on and an opportunity for institution building.

In Gilgit, land and irrigation development, as well as control over forests and pastures, were traditionally spearheaded by feudal chiefs such as Mirs and Rajahs. They could use the authority of the State to induce or constrain their subjects (through forced labour and transfers, exile, and punishment) to construct new channels, rehabilitate old ones, develop new land, restrict the exploitation of forests, and enforce rules for summer and winter grazing. There was a system, therefore, for maintaining and increasing society's vital physical infrastructure and the natural resource base.

A general decline in feudal authority commenced with the arrival of the British administration in 1892. This decline appears to have become more pronounced in the last 35–40 years. The feudal states were formally abolished in 1974. The effect of the decline in feudal authority is evident in the slow pace of irrigation and land development and a diminishing natural resource base. For example, despite growing populations, no land settlement schemes were undertaken that matched the size of projects sponsored by the Mirs.

Whereas the Mirs had helped establish new villages, AKRSP's irrigation development programme has opened up additional land to existing villages in magnitudes that are at least as significant as the achievements of the *Mirs*. There is a significant difference, however, between how villagers perceive irrigation development and how they perceive forest and pasture management. This perception has to do with the perception of ownership. As feudal chiefs were replaced by government administrators, the forests and pastures of the feudal states became the *de jure* property of the Government of Pakistan, acting through the Forest Department of the Northern Areas. Irrigation channels, however, and lands contiguous to villages remained outside the government's domain. Thus, when AKRSP arrived on the scene in Gilgit, it found the villagers keen to improve their irrigation infrastructure, but it has had difficulty organizing villagers to improve the management of their common natural resources. The situation now is that the Forest Department has *de jure* jurisdiction over much of the forest and pastures but the actual position resembles open access. Overexploitation is observed and there is little or no investment in sustainable management.

*AKRSP Experiences with Common Property Management*

In the last five years, both AKRSP and the villagers have been challenged to devise new rules and conventions for the management of village resources, sometimes in an ambiguous legal and institutional situation. This has happened particularly when the traditional status of a resource has undergone change or when new assets have been introduced.

An early example of great interest was that of land development. AKRSP-sponsored irrigation channels assisted villagers in converting low-productivity, winter grazing land into potentially high-productivity, multiple-use farm land. The grazing land, by tradition, belonged to the entire village, so all households descended from those who established the village had equal rights to it. But how were the villagers to implement AKRSP s principle of private ownership and collective management on this now irrigated new land? The villagers responded with a full range of options on various combinations of ownership and collective management.

At one extreme, some villages simply divided up the new land by handing the plots over to individual households which then developed the land through their own resources. However, even these villages generally approached AKRSP for land development loans through their VOs. At the other extreme, Khaiber Village in Upper Hunza has a VO that is the regional leader in terms of land and labour specialization. The new land there is being developed as a single farm, and portions of it will be transferred to individuals for farming after it has been fully developed. The VO will continue to own the fruit orchard and the fruit-cum-forest nursery on the new land. Women have been trained to manage the nursery. All irrigation on the new land is undertaken by three specialists. There are various other village specialists, as well, and all are remunerated by the VO.

In between these two types of management system, there are wide variations in what the villagers have adopted. By and large, new land is divided up (usually equally, according to traditional rights) among individual households, but specific inputs may be managed collectively. These inputs include loans for land development, transport and implements for land development, fertilizer, seed and saplings, the services of village specialists, and, quite often, labour pooled among neighbours. In terms of collective management issues,

AKRSP's first phase was dominated by the land development process. The major lesson for AKRSP was that it should not insist on the VO treating its new land as a single farm. It should, instead, encourage the rapid and equitable development of land through collective management of critical inputs.

A multiplicity of issues arose in the second phase as the VOs began to tackle non-traditional assets and the supra-village dimensions of collective management. For both, the VOs had to define new rules and conventions. Not surprisingly, they did so, usually with reference to traditional patterns of management. AKRSP has catalogued and discussed these experiences in its Fifth Annual Review (AKRSP 1987c), and the experience with forest and pasture management is too limited to offer operational generalizations at this stage. The case studies discussed may instigate the articulation of a few operational guidelines for AKRSP.

*The Legal Situation of Forests and Rangelands*

The legal situation of forests and rangelands is governed by the Land Revenue Act, 1967 (XVII of 1967), Section 50, the Forest Act of 1927, and the Northern Areas Wildlife Preservation Act of 1975.

According to the Land Revenue Act, the presumed ownership of forests, quarries, and wasteland rests with the government, unless there is a written record of rights to the contrary completed by or before November 1871. A record of rights was drawn up wherever land settlement took place. In Gilgit District, land settlement took place in only one of the five subdivisions. Hence, in four subdivisions, there is no question of records of rights. After the *Mirs* and *Rajahs* were deposed in 1974, all land without a record of rights was resumed by the Government of Pakistan, Northern Areas' Administration, under the Land Revenue Act. The Administration's Forest Department maintains, therefore, that the region's communities have no claim whatsoever over forests, except as provided by the Department under the Forest Act of 1927. The Department further maintains that the villages have an option only over *shamlaat* forests, i.e., those on land accessible to the village irrigation channels. Finally, the Department maintains that the forests of six of the nine villages selected for this study belong to the State and the remaining three villages are said to have an insignificant number of forests.

The concessions provided to local communities under the Forest Act are listed (CDC 1987). These concessions differ according to the legal status of the forest. The ownership and management of natural forests are of three types:

- private: usually commercially exploited;
- State: State control of local and commercial use; and
- reserved: ownership and management by the State.

The matter of community use rights arises for State forests (category 2 above). Briefly:

- there are no rules for grazing, but it is prohibited in specified areas of National Parks under Section 7 of the Northern Areas Wildlife Preservation Act;
- villagers within five miles of the forest, or with traditional rights over it, can apply for the use of standing timber for domestic purposes upon payment of a concessionary fee;

- such villagers also have free use of any dead, dying, or diseased timber for fuelwood; those living more than five miles away need a transport permit, which is free;
- timber for commercial use may be extracted upon payment of a standard fee; and
- fuelwood obtained by contractors for commercial purposes requires a charge of Rs 5 per 100 kg and a transport permit (fuelwood sells in many parts of the district for one rupee per kg).

There have been recent incidents that have eroded the Forest Department's unqualified control over the use and management of State forests. The most contentious case is that of the Chalt-Chaprote Forest and this is discussed later in this paper. In this case, the Deputy Commissioner of Gilgit, acting on an application by the community, authorized the community to exercise control over the neighbouring forest. Such control was previously completely vested in the Forest Department. Legal support for the orders passed by the Deputy Commissioner may conceivably be found in the Forest Act, but this has not been confirmed by the present author.

Local communities also contend that the procedures specified by the Forest Act before resumption or reservation of forest lands have not been followed by the Forest Department. In particular, it is alleged that villagers were not given the opportunity to establish claims over resumed land, nor was there a land settlement made by any government.

In general, the ambiguous legal situation in Gilgit will continue to plague attempts at improved resource management. The options currently available to the administration are:

- continue with the status quo which will result in a continuing and rapid depletion of forest cover and degradation of pastures;
- seek to enforce the authority of the Forest Department which will lead to confrontation in a sensitive part of the country; or
- offer to work with AKRSP and the VOs, which will be effective if the VOs can devise rules for internalizing the costs and benefits of resource use.

Given the constraints on the Forest Department, there is a recognition among sections of the government that the last option potentially represents the most effective strategy. If this view can be articulated as official policy, then AKRSP and the VOs will need to respond to the challenge of developing institutions that can demonstrably sustain and improve the natural resources of the district.

## THE MANAGEMENT OF NATURAL RESOURCES: VILLAGE LEVEL EVIDENCE

### Background to the Village Studies

*The Selected Villages*

Nine villages in Gilgit District were chosen for an in-depth study of institutional arrangements for resource management. These nine villages are: Broshal, in the Nagar Tehsil of Nagar Subdivision; Khaiber, in the Gojal Tehsil of Hunza Subdivision; Passu, in the Gojal Tehsil of Hunza Subdivision; Roshanabad-Sherabad, in the Aliabad Tehsil of Hunza Subdivision; Rahbat, in the Sikanderabad Tehsil of Nagar Subdivision; Rahimabad I, in Gilgit Subdivision (which has only one Tehsil); Oshikhandass, in Gilgit Subdivision;

Sherqilla, in the Punyal Tehsil of Punyal-Ishkoman Subdivision; and Thingdass, in the Punyal Tehsil of Punyal-Ishkoman Subdivision.

The important features of the nine villages, presented in Table 29.1, are: (1) access—on or off the KKH; (2) agro-ecological zone—one-crop, two-crop, or two-crop transitional; (3) number of AKRSP-sponsored VOs in the village; (4) scale of village—large, medium, or small—and the number of AKRSP-sponsored VOs operating in the village; and (5) whether or not off-land employment opportunities are substantial.

**Table 29.1. Some basic characteristics of the nine selected villages**

| Village name | On KKH? | Agro-eco zone | No. of VOs | Village size | Strong off-land opportunities[3] |
|---|---|---|---|---|---|
| Broshal | No | 1-crop | 1 | Medium[2] | No |
| Khaiber | Yes | 1-crop | 1 | Small | Yes |
| Passu | Yes | 1-crop | 1 | Small | Yes |
| Roshanabad- | Yes | 2-crop | 1 | Small | Yes |
| Sherabad | | transit.[1] | ? | | |
| Rahbat | No | 2-crop | 2 | Large | No |
| Rahimabad | Yes | 2-crop | 2 | Medium | Yes |
| Oshikhandass | No | 2-crop | 3 | Large | Yes |
| Shergilla | No | 2-crop | 3 | Large | No |
| | | transit. | ? | | |
| Thingdass | No | 2-crop | 1 | Small | No |
| | | transit. | ? | | |

[1] Double-cropping extends up to about 1,850 masl, but villages at that altitude cannot expect the second crop (maize) to mature with certainty; these borderline villages are referred to as 2-crop transitional.

[2] A medium-sized village has 100–150 households.

[3] Strong off-land employment opportunities are evaluated subjectively by the author in terms of both seasonal and permanent jobs.

*Source*: Author

For the study, the organizational structure of each village was examined with respect to a number of natural resources and other common property. The purpose was to analyse the performance of the village vis-a-vis a list of indicators of collective management. Both traditional and non-traditional forms of common property were examined so as to identify the institutional innovations introduced by a village. In particular, the analysis focussed on:

- any outstanding strengths and weaknesses of the VO;
- significant elements of the process of constructing and maintaining the irrigation channel and the subsequent process of land development;
- the organization of a cadre of village specialists who perform specialized tasks for remuneration by the VO;
- innovations in the management of forests and pastures; and
- brief notes on the VO's performance with respect to non-traditional common property such as community-owned tractors and VO-owned hybrid cattle (the latter is the Heifer Project).

Table 29.2 summarizes the presence or absence of selected indicators of collective management in the nine villages. In addition, the case studies provide basic locational

and agro-ecological data on each village, supplemented by some statistics on the resource base.

**Table 29.2. Indicators of collective management in the nine selected villages**

| Village | Access to *nullah*[2] | PPI | Land Loan? | Develop. Tract? | Common project? | Heifer |
|---|---|---|---|---|---|---|
| Broshal | Shared | Irr. | Chnl | Yes | Yes | No |
| Khaiber[1] | Exclusive | Irr. | Chnl | Yes | Yes[3] | Yes |
| Passu[1] | Exclusive | Irr. | Chnl | Yes | No | No |
| Roshanabad-Sherabad | Shared w/5 VOs | Irr. | Chnl | No | Yes | No |
| Rahbat | Shared w/8 VOs | Irr. | Chnl | No | Yes | No |
| Rahimabad I[1] | Shared w/4 VOs | Link rd./ Irr. | Chnl | Yes | Yes? | Yes |
| Oshikhan-dass[1] | No *nullah* | Sed. | Tank | No | Yes | No |
| Sherqilla[1] | Shared w/2 VOs | Irr. | Chnl | Yes | Yes | No |
| Thingdass[1] | Shared | Irr. | Chnl | Yes | Yes | No |

[1] The village also has at least one cooperative society other than the AKRSP VO; Oshikhandass and Sherqilla have 3–4 cooperatives each.

[2] *Nullah* is the local term for the valley/watershed in which the forests and pastures are located;

[3] A (?) against the 'Yes' for community tractor indicates an unconfirmed statement that the tractor is owned by a village cooperative society.

*Source*: Author

*The Traditional Management System for Village Resources*

The majority of villages in Gilgit District are located on alluvial fans or river terraces, dominated by a backdrop of steep mountains with narrow openings into *nullahs* that lead to alpine pastures, glaciers, and snowfields. The *nullahs* contain mountain streams that feed the gravity channels which irrigate the fans and terraces. From cultivated fields, water drains freely (when it is abundant) into rivers that merge into the River Gilgit or the River Hunza, which, after their confluence near Gilgit Town, flow into the River Indus within the boundaries of Gilgit District.

The *nullah* contains one or more alpine pastures and, occasionally, flatter meadows and land sown with barley or potatoes (Kreutzmann 1985). The highest among these pastures are at 4,600 masl, and they are used only for grazing yaks, although they may sustain protected wildlife (including the snow leopard). The migration of livestock to the pastures starts in April and May. Usually men and children accompany the animals to the pastures but in *Wakhi*-speaking areas (including Gojal *Tehsil*) women maintain the dominant role in tending livestock and making dairy products in the pastures. Each stage on the way to the highest pasture has huts for temporary residence, usually next to the watering holes. These resources belong to the villages using the pasture. Barley or potatoes may be cultivated on individual fields. Forest products may be brought down from the *nullah* on donkeys or carried on the back. The return movement from the pastures to the villages takes place in September or October.

The snowfields and glaciers in the *nullah* melt into mountain streams that are tapped for irrigation. The channel head may be several miles from the village, and its maintenance is the collective responsibility of the village. In spring, the entire village turns out to clean the channel before the date for first irrigation. This common effort is part of history and is referred to as *rajaki*. Violators of *rajaki* are required to pay a fine, usually wages for the number of days on which the individual absented himself from *rajaki*. Much of the length of a channel may be lined with trees that are individual property. Routine maintenance during the agricultural year is carried out by one or more *chowkidars* paid through contributions made by the villagers in cash or kind. The *chowkidar* enjoys a high status in the village. In periods of water scarcity (such as at the time of planting in spring) the villagers practice *warabundi*, i.e., a roster of turns by which water is used by each farmer for a specified length of time.

The land beyond the access of the irrigation channel is usually steep and uncultivated, supporting some grass and *hyppophae*. It is usually grazed in winter by free-grazing livestock. This winter 'pasture' is common land. Winter grazing also takes place on other uncultivated land, if any is available, by tradition, in the proximity of the settled village. Significant parts of such land have been converted to higher pay-off uses once irrigation has become available, because such land has represented the natural avenue for expansion in cultivated areas over the years.

Steep slopes often dominate the landscape below the irrigation channels and above the settled villages. With careful irrigation, this land can support lucerne and trees that are planted on individually owned plots running vertically down the slope.

The settled village itself is dominated by houses, individual crop fields, and trees on steeper land. Farming fields are often surrounded by trees. There are well-defined rules governing the distance at which a tree can be planted from a neighbour's field. These rules are meant to ensure adequate sunlight and water to field crops. After the maize harvest in autumn (or after harvest in the single-crop areas), all crop fields may be grazed for stubble. Free-grazing coincides with the arrival of livestock from the alpine pastures. (Some villages are now beginning to ban free-grazing, perhaps in response to the benefits from tree planting on village land.) Steeper parts of the settled village are planted or allowed to regenerate as individual woodlots.

The version of traditional systems, as depicted above, is becoming increasingly differentiated as different villages respond in different ways to the forces of change. Some of the important aspects of this differentiation are brought out in the case studies below.

*General Analysis of Village-level Organisations*

The VOs sponsored by AKRSP have several features in common. The membership of the VO is open to all households in the village. The general rule is one male per household, but exceptions to this rule may be found in instances where an occasional household contributes two members to the VO. When women participate actively, it is either through their own organization or by attending the VO meeting. In traditional villages, there is little active participation by women. In many Ismaili villages (particularly the *Wakhi*-speaking ones) men and women meet in a joint assembly and, in other cases, women may be represented in the VO by selected (male or elderly female) individuals.

In large villages, there are multiple VOs organized on the basis of neighbourhoods. Where the neighbourhood coincides with an irrigation channel's access area, each VO

will have its own land development plan and loan, otherwise, land will be developed jointly by the VOs concerned. Similarly, when one project has to be implemented by several VOs, each VO is apportioned a share of the work by consensus. The multiplicity of VOs within a village does not, at present, affect the management of forests and pastures common to the village.

The VOs were formed initially to implement and maintain PPI projects, start a group savings programme, and nominate and support a cadre of village specialists trained by AKRSP. They initially met every week. Over time, the VOs have acquired a longer-term perspective on village development and now participate in all the programmes offered by AKRSP and collaborating agencies. They also meet less frequently (two to four times each month) now that the vast majority of VOs have completed their PPI projects.

VOs receive a grant from AKRSP for implementing their PPI projects. Most, but not all, VOs were far-sighted enough to save from this windfall labour income and deposit the savings in the VO's group account. These savings were augmented over time by savings from the sale of produce and non-farm employment. The 376 VOs of Gilgit District had combined savings of nearly Rs 24 million by the end of 1987. These savings are used by AKRSP and its collaborating bank as cash collateral against which the VOs are given loans for various development programmes. Rs 39 million had been disbursed as short-term and medium-term loans by the end of 1987, with a nearly flawless recovery record so far.

Unskilled labour for village projects is contributed by the villagers themselves. If the work is to be done without payment, as under the *rajaki* system, then each individual is expected to contribute equally; defaulters will pay the wage cost of their absence. Presence may be voluntary, as with PPI projects, if labour is being paid wages. The tradition is to reserve village-level tasks for the villagers themselves, although that tradition is now changing as more and more market exchange of labour develops. A village will also give preference to its own residents when hiring skilled labour.

Technical services for the VOs come from AKRSP and collaborating agencies and from the villagers themselves. AKRSP has a field unit called the Social Organization Unit (SOU), consisting of a Social Organizer, an engineer, and an agriculturalist. This unit is mobile and provides AKRSP with its technical and motivational outreach to the villagers. The VO itself supports a cadre of village specialists, in practical and managerial skills, who are trained by AKRSP and remunerated for services and supplies by the VO; supplies may be obtained at cost from the AKRSP.

The mobilization of resources from among VO members is subject to a variety of rules (or, in some cases, no rules). For financial resources, contributions from members may be raised by one of the following mechanisms:

(1) a fixed minimum to be contributed by each member;
(2) an equal contribution by each member;
(3) contribution in proportion to perception of benefits;
(4) contribution on the basis of economic status; or
(5) a contribution left to the decision of the individual.

There are no aggregate data on how many of the VOs follow each type of rule. Before AKRSP started interceding with the VOs, the majority of them appeared to be asking for a minimal fixed amount from their members for group savings. AKRSP's

suggestion has been to adopt options (3) or (4) and many VOs have responded positively to this suggestion.

In the case of the utilization of loans given by AKRSP, there is a difference between short-term production loans and medium-term development loans. Short-term loans (for fertilizers, plants, marketing, etc.) are given out by the VO according to a household's demand for inputs or contributions to the produce that is marketed. Medium-term land development loans are divided equally among VO members, the rationale being the suggestion by AKRSP that a minimal amount must be available to each member to preserve equitability in the use of a rationed input. Better-off individuals may supplement the loan with their own cash resources.

In the case of village specialists, each user pays a fee that is in proportion to the services used. This straightforward rule applies most commonly to para-veterinarians and plant protection specialists.

Errant VO members are disciplined through a series of graduated measures. An offender who has injured the interest of part or whole of the VO will be asked to render compensation to the injured party. One who breaks a VO's rule for the protection of common property is expected to pay the stipulated fine. A refusal to honour the decision of the VO is met, initially, by an attempt by the elders to convince the offender to obey the decision of the VO. If this and other means fail to bring around the dissenter, then, the traditional penalty of social boycott of the offender's household is imposed. This is considered a severe punishment.

Communications among members of the VO take place formally in the VO meeting. Here, VO matters are discussed, the options offered by outside agencies are examined, and every member has the right to express his opinion. Decisions are reached by consensus or majority vote. VO decisions are communicated to AKRSP by means of a resolution of the VO. The resolution is forwarded to the area's Social Organizer, whose recommendation on it is nearly always respected by the management group. The Social Organizer and his associates on the SOU tour their area almost non-stop and provide the most reliable and effective channel for communications between VOs and the management group of AKRSP. In addition, frequent field visits are undertaken by the management. The VO itself sends its office-bearers and specialists to Gilgit for VO conferences and refresher training in specialist skills. Proceedings of VO conferences (one every month, for about 80 VOs each) are published and sent to each VO through the SOU.

The VOs interact formally or informally with a large number of religious, political, social, economic, and government organizations. It is not possible to sketch out the relationship between the VOs and each of the other organizations active in Gilgit District. In the next two paragraphs, a list of such organisations is presented to illustrate the context in which the VO works.

All villages have regular religious and traditional gatherings in addition to VO meetings. Many villages have a formal religious organization working in the village. The Ismaili villages participate in the programmes of the various Aga Khan service institutions (for health, education, and housing). Many villages, particularly those supported by the Aga Khan Economic Planning Board, have village cooperative societies.

The political structure of the district revolves around the system of Local Bodies and Rural Development (LB&RD). There is a District Council in Gilgit with an Annual Development Plan drawn up on the recommendations of District and Union Council

members. Each Union Council covers three to five villages, and there is a Union Council member from practically every village. Elected councillors are provided with technical support by the LB&RD Department of the Northern Areas Administration. Other line agencies operating in the district include; the Agricultural Department, the Animal Husbandry Department, the Forest Department, the Northern Areas Public Works Department, the Health Department, the Education Department, and the Social Welfare Department. In addition, there are commercial institutions, including scheduled banks and specialized institutions for agricultural, industrial, and cooperative capital.

## The Situation in Individual Villages

### *Broshal*

Broshal is the highest of the nine villages studied. Its altitude is 2,740 masl (only one crop can be grown each year on a given plot of land), and it is located 130 km from Gilgit and 40 km from the KKH, in the Hoper Valley of Nagar. Broshal lies in one of the more remote parts of Gilgit. Its 105 households belong to the Shia branch of Islam.

The documentation on Broshal and its neighbouring hamlets includes the works of Butz (1987) and Semple (1986) and notes and case studies undertaken by the SOU of the AKRSP.

The following organizations are active in Broshal: the Union Council of the LB&RD System; the Project Committee of LB&RD; the traditional *jirga* (council of elders); the Committee to oversee the *Imam Bargah* (religious place); the AKRSP-sponsored VO, and two committees set up under the aegis of the VO to manage the VO's tractor and enforce the livestock grazing rules of the VO. The Aga Khan Health Services are exploring the terms of partnership under which they can collaborate with the Broshal VO. In addition, there is a government school and dispensary.

Traditionally, as in other villages in the district, Broshal had a council of 7 to 10 elders (the *jirga*) led by the village headman (the *numberdar*). The *numberdar* was appointed by the *Mir* and was also responsible for the collection of taxes from the village. The *jirga* regulated the management of natural resources at the village level, including water distribution and allocation, channel maintenance, movements of livestock to the various pastures and within the village, dates of closure of pastures, etc. This system appears to be in force even today, but the *numberdar* has no official status, and the *jirga* faces competition from other (religious, political, and economic) organizations. For inter-village disputes, the *Mir* was the arbitrator; today, there is increasing recourse to courts and government administration.

AKRSP's intervention in Broshal started with its sponsorship of the Hunono irrigation channel. This channel already existed but was in a state of disrepair and subject to occasional destruction as a result of landslides. The villagers proposed that the channel should be improved, with concrete work where necessary, to increase the reliability of water supplies and reduce the considerable risk to their agricultural production. AKRSP's agreement to this suggestion led to the formation of the Broshal Village Organization in July 1983.

The Broshal VO is led by a strong village activist, the Manager of the VO. An ex-serviceman, the Manager has run the VO with a fair bit of personal authority in support of the AKRSP message of collective management. As a result, the VO has been consistently

ahead of other VOs in the valley in accepting AKRSP-sponsored activities, particularly those that require strong collective management. For example, it was reported in Semple's (1986) case study that the bulk (75%) of the VO's savings were raised when the Manager decided to transfer part of the AKRSP grant for the channel to the VO's group savings' account. Voluntary savings were very small and came in response to the VO rule that each member must save one rupee per week. The savings were offered by the VO as cash collateral against a loan provided by AKRSP for the purchase of a tractor, one of the first VO-owned tractors in Gilgit.

The purchase of the tractor led to the first institutional innovation by the VO. The VO set up a tractor committee to manage the day-to-day affairs of the tractor. It appears, however, that the tractor's operations in Gilgit Town (when it is not in use in the village) are in the hands of a relative of the Manager who lives in Gilgit. The committee's existence has been a source of some concern at AKRSP, since AKRSP fears that such committees may take over control of an asset rather than remaining answerable to the general body that elected them. The tractor committee has not, so far, usurped the powers of the VO over tractor affairs. At the same time, the VO has decided that each member will deposit Rs 200 in group savings against future payments for the tractor, whether for maintenance or for loan repayment.

The VO also established a committee to control free grazing in the village. The committee drafted both punitive and preventive edicts. It is possible that the committee is effective in discharging its mandate. It needs to be noted, however, that Broshal experiences some seasonal migration of men. Control over free-grazing reduces the returns from livestock by increasing the labour cost of livestock control. For free-grazing to be controlled, the villagers must realize greater gain from the crops that can be grown on the controlled fields. It is not yet clear whether this trade-off has been resolved in favour of crops and against livestock.

The village has an active para-veterinarian who has earned significant amounts from vaccinating livestock and considerably reducing their mortality rates. This specialist has been remunerated regularly by the VO for his services and supplies.

There are no significant innovations in the management of forests and pastures. The traditional system of the Hoper Valley continues to be in place.

*Khaiber*

Khaiber village, lying in the single-cropping zone at an altitude of 2,600 masl, and about 180 km from Gilgit Town on the KKH, has perhaps the most remarkable village organization in AKRSP's project area.

Khaiber has 55 households belonging to the *Wakhi* ethnic group and following the Ismailian tradition of Islam. These villagers are highly educated and close-knit. Their VO is led by a superior village activist, the President of the VO.

The documentation available on Khaiber includes four papers prepared for an AKRSP workshop—Abidi (1987), Husain (1987b), Hussein and Karmali (1987), Magrath (1987)—and Caroe (1986), CDC (1987), Meghji et al. (1987), and Semple (1986).

The following organizations are (or have been) active in community-oriented work in Khaiber: the Union Council of the LB&RD System; project committees set up for specific LB&RD projects; the project committee set up to implement the rural water supply project of the Community Basic Services Programme of UNICEF; the Government of Pakistan

and the Aga Khan Foundation; a cooperative society; the Aga Khan Health Services; the Aga Khan Education Services; an AKRSP-sponsored village organization; its Project; the *Ismailia* Local Council; and the Ismailian *Tareeqi* Board (for religious affairs). In addition, there is a government school for boys and a school for girls managed under the Aga Khan Education Services. There is also a hydroelectric power station that provides electricity to the neighbouring villages of the Gojal *Tehsil*.

The Khaiber VO is unique because of the extent of collective management practised by it. The AKRSP-sponsored, new irrigation channel has enabled the VO to irrigate and develop a large tract of previously low-productivity, winter grazing land, lying at a distance of 2–3 km from the village. The VO allotted portions of this land for use as cropland, a fruit orchard, and a multi-purpose nursery for fruit and vegetables. All the new land is considered to be the common property of the VO, although the cropland will be assigned to individuals through the traditional system of lottery once it is developed. The VO has hired three *chowkidars* to be responsible for the irrigation of the new land. This is an innovative extension of the traditional practice of hiring a village *chowkidar* to clean and maintain the irrigation channel. Development of the crop land is the responsibility of the VO and individuals are assigned duties by turn to manage this process. The nursery is managed by the women of Khaiber, with the assistance of one male specialist and six women trained by AKRSP. Marketing from the new land is also done collectively by the VO. Women participate regularly in VO meetings and have a say in collective decision-making over common property.

Because of its ability to manage assets collectively, Khaiber was selected to be the recipient of 10 high-yielding hybrid cows which had to be housed in a single unit. This operation is part of a grant from Heifer Project International. The VO sent its nominees for training in basic animal production techniques, it allotted a piece of land (2–3 km from the settled village) for the construction of cattle sheds, and it organized the supply of considerable amounts of fodder that were needed by the new cows. The most recent information available indicates that the Heifer Project cows have the highest milk yields among all eight of the Heifer Project villages sponsored by AKRSP.

The Khaiber Village Organization supports a large cadre of village specialists. One of the earliest specialists was the para-veterinarian. His effectiveness in reducing mortality rates has enabled him to pursue his new speciality as a part-time job. The VO has also invested Rs 550 in an automatic syringe, thereby reducing the time costs of vaccination. Part of this saving has been passed on to VO members through lower charges. Several other specialists in Khaiber pursue their new vocations as part-time jobs, thus testifying to the VO's ability to create new employment opportunities within the village in response to the perception of higher returns for specific farm-based activities.

The issue of changing patterns of profitability has also influenced the village to take steps to stop the centuries-old practice of free-grazing. Villagers are convinced that free-grazing needs to be controlled in order to benefit from the improved marketing opportunities for fruit. Apple trees can now be seen in wheat fields, although previously no tree could last long outside a boundary wall. The village has found it possible to transfer free-grazing animals in autumn to its traditional winter pasture. Thus, an institutional innovation has come about as a result of changing markets and the relatively small cost of institutional change.

The overall trend in the allocation of labour, land, and livestock in Khaiber appears

to be one of specialization. This specialization has been carried out with innovations and has reinforced the spirit of collective management. It is possible, taking the example of Khaiber, to see specialization in resource use as an innovative response to changing patterns of profitability and innovations in collective management as vehicles for growing specialization. Numerous jobs have been created in the village as a response to new ways of increasing income from agriculture. This has happened (in contrast to some other villages) despite the availability of off-farm opportunities and a high level of education in the village.

*Passu*

Passu is very similar to Khaiber in terms of some important features; and yet it represents a development situation that varies substantially from that of Khaiber. Passu, with 67 *Wakhi*-speaking households of the Ismailian tradition, is located at an altitude of 2,440 masl, about 150 km from Gilgit Town on the KKH. It is in the single-cropping zone. Documentation available for Passu includes the four workshop papers cited above for Khaiber, as well as AKRSP (1984), CDC (1987), Conway et al. (1985), Kreutzmann (1985), Saunders (1983), and the World Bank (1987).

The following organizations are (or have been) active in Passu; the Union Council of the LB&RD System; the project committee for rural water supply under the Community Basic Services Programme of UNICEF; the Village Production Group organized by the Integrated Rural Development Programme (IRDP) of the United Nations Development Programme (UNDP/FAO); a multipurpose cooperative; a potato seed growers' association organized by UNDP/FAO to work with a commercial firm (Jaffer Brothers); the VO and its women's group; and the Ismailian Local Council.

According to one hypothesis (World Bank 1987), the distinguishing feature of Passu is that it commands access to the Passu and Batura Glaciers, and the surrounding alpine scenery is popular with growing numbers of tourists, trekkers, and expeditions. According to another point of view, Passu is distinguished by its factional VO and the lack of an acceptable activist within the VO.

Passu's PPI project is a new irrigation channel that takes off from the Batura Glacier and brings water to a large tract of land that was previously used for winter grazing. As a result of the new channel, each household in Passu increased its land holding with an additional 4.5 ha. This channel has succeeded in bringing water to the new land, whereas several attempts before it had failed. It appears that the major reasons for earlier failures were: (1) the lack of proper surveying techniques and (2) the uncertain movement of glaciers. Villagers, using the traditional methods of following the water level, ended up with the channel being too low to have access to any significant area, or else the glacier advanced to a point which made the location of the take-off point too low for necessary access. The AKRSP assisted the VO by putting down a proper alignment. The site survey also used information on the movements of the glaciers collected by Chinese road engineers in the course of their work on the KKH.

The successful completion of the channel led to an expectation on the part of the AKRSP that the Passu VO would take up land development promptly and complete it speedily; this did not happen. The villagers of Passu observed that the process of making a new channel operational for full discharge is a long process that may take five to eight years and their observation has been borne out by the experiences of other

mountain communities. The AKRSP believes that the VO's collective management of land is hampered by discord within the VO and the inability to perceive the value of investing in a sustainable source of income from agriculture. It appears that most able-bodied villagers prefer to work as trekking guides in the summer (at about Rs 110 per day), rather than investing labour or cash in land development. Moreover, Passu's land development, unlike Khaiber's, is an individual affair for each beneficiary household, even though the VO has taken a collective land development loan from AKRSP. The use of new land in Passu does, however, resemble that of Khaiber, in that tree (particularly fruit) crops appear to be preferred to annual crops.

Clearly, the residents of Passu are responding to new opportunities by seeking a balance between short-term prospects for cash income and the longer-term payoff to investment in land. In the short term, there is a movement of labour and other resources away from agriculture and livestock. Kreutzmann (1985) observes that many of the huts in the alpine pastures inside the Passu *nullah* now lie vacant, as fewer people make the seasonal trek with their livestock to the pastures—the treks made today are with tourists and for cash income. Thus, the glaciers and their surrounding scenery are being transformed into multiple-use resources, while prior to the KKH they were of importance only to agriculture and livestock.

The financial and entrepreneurial resources of the VO and its members are also subject to the strong dual pressures of competing agricultural and non-agricultural uses. For example, VO savings, normally reserved for investment in agriculture, were used to purchase stocks for an electrical goods store to be operated by the VO for all the neighbouring villages that presently receive power connections. Similarly, there appears to be a reluctance on the part of the VO to nominate villagers for training in specialized functions; most eligible candidates prefer non-farm employment. The case of the neglected VO para-veterinarian indicates, too, that the effect of competing demands on resources is magnified by the factionalism in the VO. On the other hand, the VO has responded with enthusiasm to the highly profitable seed potato production programme introduced by the UNDP/FAO and a commercial firm. In the short run, income from seed potatoes is estimated to equal the income from tourism in Passu. In the long term, both activities are liable to be associated with environmental problems (the potato programme because of sustainability and disease-resistance issues).

The changing patterns of incentives have placed increasing responsibility for farming on women. It is conceivable that specialization in labour over time could make women the farmers of the village, while the men take up more remunerative non-farm jobs. The importance of this transformation is appreciated by the VO and AKRSP, and a conscious attempt is made by both to channel motivational and other inputs to women.

By and large, there is evidence that both social and economic forces are responsible for the substantial difference between Khaiber and Passu. While Passu has much easier access to non-agricultural income, it is also more factional as a village organization. One consequence of the latter is that there is lack of clarity in the VO's medium-term perspective—the balance between traditional resource use and new opportunities has yet to be articulated by the VO and AKRSP. In particular, there is little recognition of the value of specialization in labour for managing the entire range of options available to the village.

*Roshanabad-Sherabad*

Rosshanabad-Sherabad is a small village of about 20 households, lying on both sides of the KKH in Central Hunza, about 95 km from Gilgit Town. The village lies at an altitude of about 2,000 masl, and maize, the second crop, is used for fodder since it does not ripen as grain. The inhabitants speak Burushaski, the main language of Hunza, and belong to the Ismaili branch of Islam.

Documentation available on the village includes Meghji and Saleem (1987) and Neseem (1986). The following organizations are active in Roshanabad-Sherabad: the Union Council of the LB&RD System; the project committee for rural water supply under the Community Basic Services Programme of UNICEF; and the VO and its women's group (and their smaller nursery and tractor committees). In addition, there is a school nearby and a hydroelectric power station that provides electricity to Central Hunza.

The Roshanabad-Sherabad VO has a strong and well-educated leader and is a close-knit organization. VO membership includes women who participate fully in all VO meetings. Thus, from its inception, the VO has been active in pursuing women's development activities with the same vigour as those for men. In particular, the women have been managing a multi-purpose nursery, defining the procedures for income-sharing from this new common asset; they have also taken up a number of appropriate technology devices, such as nut-crackers (for apricot kernels) and fruit pulpers. Given the same broad pressures for changing gender roles as those that prevail in Passu, Roshanabad-Sherabad seems to have accomplished more in preparing for change by involving women.

The PPI project for this village was an irrigation channel. The VO also took out a loan at an early stage for a tractor. The purchase and operation of the tractor turned out to be a saga of unforeseen circumstances. These events were narrated by VO representatives at a conference of VOs in Gilgit and drew applause from the audience for both humour and relevance. The story illustrates the tremendous institutional innovation and managerial capacity that is required for acquiring and maintaining non-traditional assets and technology.

The Roshanabad-Sherabad VO has, since its inception, tried to develop a complete cadre of specialists for the activities undertaken by the VO. It has, for instance, a marketing team, with individuals nominated for fruit and livestock marketing and others trained in fruit processing and packaging. It also has groups of women working, by turn, on the nursery (this is also observed in Khaiber). Like Khaiber VO, therefore, Roshanabad-Sherabad appears to be moving towards specialization in labour and management.

In a formal sense, the VO is a leader in village planning. It regularly works out (and presents on flip charts) a five-year plan for village development. While the earlier emphasis was on AKRSP-sponsored programmes, the plan now shows education and civic components as well. The plan is fairly basic, in that it lays down targets for products to be marketed, land to be developed, etc. It does not, as yet, show the ways and means for achieving the targets. The planning exercise shows how a basic concept introduced by AKRSP (initially for land development planning) is being extended and redefined by the VO; it points to the possibilities for innovation in planning for village development.

*Rahbat and Its Neighbouring Villages*

Rahbat is located about 60 km from Gilgit Town and about 5 km from the KKH in the Chalt Valley of Nagar Subdivision, at an altitude of about 1,800 masl. Chalt Valley, with

a population of over 4,000 followers of the Shia branch of Islam, includes six villages with nine VOs. While much of the development activity is carried out by individual VOs, issues of natural resource management have entailed cooperation among two or more of the VOs. Thus, it is important to discuss both village-level and supra-village innovations.

The cluster of villages in Chalt has particular significance because of the evolving situation in the Chalt-Chaprote *nullah*. Here, the community of resource users has intervened to take control over the natural forest and pastures of Chalt-Chaprote. This development represents a test case that will challenge the ingenuity of AKRSP, the VOs, and the government in dealing with the issue of community control of natural resources.

Documentation on Rahbat and the neighbouring villages includes CDS (1987), Gohar (n.d.), Gohar et al. (n.d.), Hunzai (1987), and Jan (n.d.).

Rahbat Village has the following development organizations: a project committee set up under the LB&RD System; the Union Council of the LB&RD System; a project committee set up to implement the rural water supply project of the Community Basic Services Programme of UNICEF; the AKRSP-sponsored VO, its affiliated women's group, the forest management committee set up by Rahbat and its neighbouring VOs; and the Aga Khan Education Services.

After visiting the Gilgit area in 1986, a team of workshop participants had recommended that the 'AKRSP could make a valuable contribution by interceding with the Government to return these forests to the status of locally held commons, to be managed by an organisation—complete with enforceable sanctions—established by AKRSP' (Dani et al. 1987). AKRSP's approach has been to act on institutional innovations once they appear to have the interest and confidence of the villagers. Thus, while AKRSP was waiting for villagers to establish a line of approach for new ways of managing natural resources, the villages of Chalt decided to intervene to protect and sustain their natural wealth.

Villagers who were interviewed (CDC 1987) estimated that the Chalt-Chaprote forest is now only one-fourth of what it was about 20 years ago. The rapid depletion of forest and pasture is due to the changes in incentives that started with the construction work on the KKH. This brought about significant increases in the value of forest products; grazing has been particularly damaging to juniper regeneration. There is no doubt that the changes have benefited those in the area who were engaged in the commercial exploitation of the forest but at no little cost to the environment.

In March 1986, the six VOs of the area, acting through 36 representatives, set up a Reform Committee for Forest Conservation. Although there are several activists in the group, perhaps the most influential is a former *numberdar* from Rahbat. The Committee declared an immediate ban on commercial exploitation and domestic requirements were to be met as follows:

- only dead wood would be used for fuelwood, with each household permitted one trip to the forest every week; and
- timber would be made available upon application to the Reform Committee, which would verify the requirements and then apply to the Forest Department for approval.

A gate (or checkpoint) was set up on the road out of the village and was manned 24 hours a day. The *chowkidars* at the gate were remunerated with equal contributions from each household. Offenders were to be fined Rs 25 per *maund* (about 38 kg) of

fuelwood and Rs 500 per log of timber. The ban and sanctions are reportedly being enforced effectively.

The ban on commercial exploitation of forest still left unresolved the conflict between livestock grazing and forest and pasture regeneration. In 1987, the VOs proposed a new system of rotation that would reduce the pressures of overgrazing. They also agreed to a suggestion from AKRSP that some new tracks be constructed, to open up hitherto inaccessible parts of the rangeland, and that additional earthen tanks be built to provide water for livestock. The Rahbat VO has set up a five-person pasture development committee.

In response to the initiatives undertaken by the VOs, AKRSP is providing technical and financial assistance for sustainable forest management with community participation. This assistance is outlined in the documents prepared by AKRSP staff and listed above.

It is not yet clear how the fundamental question of authority between the Reform Committee and the Forest Department will be resolved. The Committee's intervention takes over some of the functions of the Forest Department on State-controlled forest. The villagers maintain that they are helping the government enforce forest regulations and that they have the written permission of the former Deputy Commissioner to do so. The Head of the Forest Department maintains that the Committee is a refuge for 'miscreants' bent upon the destruction of forests for their own vested interests. It is believed, however, that the Forest Department is issuing no new permits for commercial exploitation of the Chalt-Chaprote forest.

The villages of Chalt have also undertaken several other supra-village initiatives. Rahbat *Bala* and Rahbat *Paeen* VOs are working together to construct a domestic water supply project as well as a girls' school. The school represents the first instance of cooperation between a non-Ismaili village and the Aga Khan Education Services in the provision of a complete package of educational facilities. Rahbat *Bala* also hires a *chowkidar* jointly with the Chaprote *Paeen* VO for the maintenance of their common irrigation channel.

An institutional innovation at the village level was observed in Chaprote Village. This village had been gifted 10 high-yielding hybrids by the Heifer Project, with the expectation that, as at Khaiber, the cows would be kept in a collectively managed unit. The villagers of Chaprote, however, have distributed the cows to individual households who will share the costs and benefits. The reason given for this system was that it is too costly to pay cash to the attendants who were to look after the cows in the common livestock unit.

The Rahbat VO appears to be a leader, among Shia villages, in involving women in the development programmes available for the region. In addition to the girls' school mentioned above, Rahbat has a multipurpose nursery of the kind present at Khaiber and Roshanabad-Sherabad. This nursery is expected to play a supportive role in plans for sustainable forest management in the Chalt-Chaprote forest.

Most of the VOs of the valley have a full range of village specialists trained by AKRSP. These specialists are likely to include forestry and pasture specialists in the future.

In conclusion, it appears that the villages of Chalt have embarked on a dramatic course of institution building that may have relevance to many other villages in the region. The initiative by the community has placed both AKRSP and the government

in a challenging position. Whereas the government needs to articulate a response to an apparent conflict of authority, AKRSP needs to strengthen community institutions with the technical and financial assistance needed to capitalize upon the community's initiative; community intervention needs to be extended into a strategy for sustainable resource management at a high level of productivity.

*Rahimabad I*

Rahimabad I is located along the KKH, about 30 km from Gilgit Town, at an altitude of about 1,670 masl. It has two VOs—*Bala* (upper) and *Paeen* (lower)—that are organized around separate *jamat khanas* (the religious gathering place for followers of the Ismaili branch of Islam); the combined population is 125 households, mostly from the Ismaili sect but also including a number of Shia families. Both sects are represented among the office-bearers of the VOs. Because of its proximity to Gilgit Town, Rahimabad I is part of a greater Gilgit economic zone supplying produce and manpower to the urban area on a daily basis.

Information on Rahimabad I is available in Hamid (1987), Khan (1985), Meghji (1984), Meghji et al. (1987), and Semple (1986).

The following organizations are active in Rahimabad I in addition to its two VOs: the Union Council of the LB&RD System; the Ismailian Local Council; a cooperative society; and the Aga Khan Education Services. In addition, the village has a government school for boys, a school for girls managed by the Aga Khan Education Services, a government dispensary, and a government veterinary dispensary.

Rahimabad (original name Partab Singh Pura, subsequently Matum Dass) is one of the newer villages of Gilgit and thus there are people in the village (as in Oshikhandass) who can narrate the events leading up to the establishment of the village and the subsequent lengthy process of land development. According to these elders, the settlement of Rahimabad started with the construction of an irrigation channel in 1903. The construction of the channel is said to have been carried out, under the supervision of soldiers sent by Maharajah Partab Singh of Gilgit, as part of an agreement with *Mir* Nazim Khan of Hunza. The *Mir* sent 28 households from Hunza and their descendants inhabit the village today with those of the other original families. During the early stages of land development (1903–1920), the villagers brought fruit and forest trees from Hunza. Thereafter, they established fruit nurseries and obtained other tree cuttings locally.

Since 1903, the irrigation channel has been maintained with the help of a village *chowkidar*. In 1975, the then *chowkidar* applied to the VO for an increase in wages. The village agreed to increase the wages from 2 kg each of wheat and maize grain per household, per year, to 4 kg each of wheat and maize grain per household, per year, plus Rs 200 in cash from the village common fund. The revised wage rate also appears to be in effect today.

Rahimabad I was one of the first villages to form a VO after AKRSP's arrival. Its first PPI project—that for the *Paeen* VO—was a link road, through the length of the village, connecting it at both ends with the KKH. From the very beginning, the issue of compensation for land taken up in road construction dominated discussions between AKRSP and the VO and among members of the VO. Some villagers maintained that AKRSP should follow the policy of the Northern Areas' Public Works Department and pay land compensation at market rates, in addition to the cost of labour and material that is

normally included in AKRSP cost estimates. AKRSP maintained that land compensation was an internal matter for the VO to resolve. It took two to three years for the issue to disappear from the agenda of meetings between AKRSP and the VO. The VO decided that no compensation would be paid, since those who bear the loss of land also benefit the most from the road by virtue of their proximity to the road. Many of the affected families appear to support this rationale. Thus, Rahimabad represents an example of a VO internalizing the costs and benefits of public good.

Rahimabad I also provides insight into traditional and new ways of discharging financial obligations in the village. Although the VOs of Rahimabad have taken out and repaid several AKRSP loans, recovery of the first loan of Rs 6,534 for fertilizer was plagued by problems. Recovery of loans was then in the hands of the VO's model farmer, who died suddenly before the loan could be repaid to AKRSP. Some villagers report that he had already collected about half the loan from individual VO members for repayment to AKRSP. The repayment of the loan was taken over by the late model farmer's nephew, as a matter of family honour; the nephew is the current manager of a VO. A meeting of village elders was called to discuss repayment; the elders decided that well-to-do families in the village should make donations towards erasing the loan, since many of the others were too poor to pay. The understanding was that the contributors would be repaid once a second PPI project (a channel for the *Bala* VO) was approved by AKRSP. Thus, eight villagers provided what is essentially bridge funding to the VO in anticipation of an improved cashflow for the VO later on. The second PPI project was approved after lengthy debate between AKRSP and the concerned VO. In the final analysis, some of the debtor VO members have paid off some of the contributors (to bridge finance) by selling produce for cash. It is not known with certainty whether the remaining amount has, in fact, been repaid out of the grant for the second PPI.

The *Bala* VO nominated two young men for training in para-veterinarian and plant protection functions. It was soon discovered that the para-vet was, in fact, redundant, since there is an Animal Husbandry Dispensary in the village staffed by a properly trained employee from the village. Contrary to the expectations of many outsiders, the dispensary appears to be well stocked with necessary drugs and vaccines. The villagers understandably prefer the government dispensary to the VO specialist, since the government provides free services while the VO charges for cost and the specialist's fee.

Rahimabad I is also one of the villages taking part in the Heifer Project. It has been successful, so far, in keeping the 10 cows together at one, collectively managed location. Furthermore, Rahimabad is in the process of developing what little land had been left undeveloped over the years. The pattern of land use on the new land favours tree crops (understandable in view of nearby markets for fruit and wood) and the diversion of labour to urban centres.

In retrospect, Rahimabad I has consistently chosen investment options that reinforce its position on the KKH close to Gilgit. Its first PPI was a link road; it preferred the government veterinarian to the more costly VO para-vet trained by AKRSP; at the same time, it accepted the high cost of upkeep of hybrid cattle in anticipation of later returns from milk marketing; and it has developed land for fruit and forest products that are in great demand locally and nearby. In retrospect, there is little an outsider could have done to improve upon the village's investment decisions in response to changing opportunities. At the same time, Rahimabad and Oshikhandass village represent possibly replicable

approaches for agricultural development in other villages that are only now acquiring reliable and cheap access to sizeable markets.

*Oshikhandass*

Oshikhandass is a large village with 540 households from the Shia and Ismaili sects. It was established in the late 1930s, when 58 families migrated to the location and constructed an irrigation channel under the patronage of the feudal chiefs of the time. The village is situated just southeast of Gilgit Town, about 1 km along a dirt track road from the KKH, and its altitude is 1,400 masl. It is divided into three neighbourhoods (*patees*) that correspond to the ancestral domiciles of the present inhabitants. The neighborhoods are called Jagir *Patee*, Bulchi *Patee*, and Farfoo *Patee*; each *patee* has its own VO, and there are also overlapping women's organizations.

References to Oshikhandas may be found in Caroe (1986), CDC (1987), Conway et al. (1985), and Meghji (1984).

Oshikhandass has the following organizations in addition to its AKRSP-sponsored organizations: the Union Council of the LB&RD System; the Aga Khan Education Services; the Literacy and Mass Education Commission of the Government; three cooperative societies (including one trading in timber); the Ismailia Local Council; the Shia Association; and a *numberdar* system from the days of the *Mirs*.

The original 58 families that settled in Oshikhandass were each given 3 ha of land to develop. (They were not, however, given any share in the rights to the nearby *nullah*, as older villages had prior claim to it.) Additional land was brought under cultivation subsequently. Available information indicates the following rates of change over the last 50 years.

| | |
|---|---|
| Total cultivated land | 2.75% per annum: 275% over 50 years |
| Population | 4.56% per annum: 831% over 50 years |
| Land/household | 1.82% per annum: 58% over 50 years |

Subjected to the pressures of in-migration and nearby urbanization, and existing without a natural forest or pasture of its own, Oshikhandass has responded by creating a resource base that is a model for many other villages in a similar position.

Since the very establishment of the village, its residents undertook a substantial programme of forestry inter-cropping with lucerne, as they had no other natural source of fuelwood, timber, and fodder. They planted trees on the slopes behind the village, as well as within the homestead. The village is, today, a remarkable example of forestry management in the village agro-ecosystem. It is estimated that 80 per cent of the village's cash income now comes from forest products, almost all of it from individual holdings.

While livestock holdings are small, the village is attempting to improve the quality, quantity, and marketing of fruit, vegetables, poultry, and eggs for sale to the Gilgit urban market. Some of this is being accomplished through the VOs of Oshikhandass as well as its women's organization.

The Oshikhandass VO (which later split into three VOs) was one of the first two or three sponsored by AKRSP. It suffered, therefore, from a certain lack of knowledge about the intentions and approach of the management of AKRSP; the villagers simply extrapolated from their knowledge of the other agencies working in the district and paid little attention to the spirit of the AKRSP message. For example, dialogues with AKRSP staff were initially valued more for their recreational content than for discussing

development problems and solutions. VO office-bearers were chosen by lottery! Few meetings were held, and the attendance was very thin. The implementation of the PPI project—a sedimentation tank—was ignored by the vast majority of the villagers and work was handed over to a committee; the project suffered from faulty implementation and was finally completed three years after it should have been. As a large and urbanizing village, Oshikhandass has found little in the AKRSP package to interest the majority of its residents.

In turn, development agencies have done little so far to develop a menu of programmes from which villages like Oshikhandass and Passu could choose major initiatives in high-value horticulture, forestry, and agro-based industry (such as wood products, including furniture for the local market). In other words, there is a need to discover linkages between the kind of agricultural production model that AKRSP is trying to articulate, as a follow-up to its institutional model, and a rural-based model of small enterprise.

*Sherqilla*

Sherqilla, like Oshikhandass, is a large village of about 500 households, with three VOs and a women's organization. Sherqilla lies on a jeep track, about 40 km from Gilgit Town; it takes two hours to complete the journey from Gilgit to Sherqilla. The jeep track is now being widened and improved to take trucks and buses.

Sherqilla is inhabited mostly by followers of the Ismaili sect and a handful of Sunni families. The village was the seat of the former *Rajah* of Punyal, who still lives in Sherqilla. It is located at an altitude of about 1,830 masl and there are years in which the second crop (maize) does not ripen.

The following organizations are active in Sherqilla: the Union Council of the LB&RD System; project committees for LB&RD activities; Aga Khan Education Services; Aga Khan Health Services; three VOs and their women's groups; the Ismailian Local Council; and four cooperative societies. In addition, there is an animal husbandry dispensary managed by the government, a government and Aga Khan school, and a hydroelectric power station to supply electricity to Sherqilla and a neighbouring village.

The PPI project in Sherqilla was an irrigation channel. This channel was constructed by what was then the combined VO of Sherqilla. Since it was not easy for a large village to congregate regularly in one place for VO meetings, the villagers decided to divide into three VOs, based on neighbourhoods (each with its own *jamat khana*). This division took place soon after the completion of the channel. At the time of division, the financial assets of the old VO were also divided by common consent.

Soon after the channel project was completed, the three VOs applied for land development loans. They were the first VOs to receive such loans from AKRSP and helped establish AKRSP policy on land development loans. It was observed that the channel was irrigating unequal land holdings within the settled village. One option was to give out the loan in proportion to the land holdings. The option chosen by AKRSP was to give a fixed amount of Rs 2,000 to every household, on the grounds that this policy represented an equitable sharing of a rationed financial resource (i.e., subsidized credit). Accordingly, every household in Sherqilla received Rs 2,000 in medium-term credit in December 1984. It has been estimated that the actual land development cost has substantially exceeded the amount loaned out by AKRSP; the difference has been provided by individuals through direct or hired labour.

Sherqilla is, in many ways, a microcosm of the evolving situation in Gilgit. One can observe those who have too much land relative to family labour selling undeveloped land to migrants from higher up the valley; new migrants with little or no land creating a local market for grain, pulses, fodder, and dairy products, the landless and other poor working in the village on land development and haulage for wages; those with donkeys specializing in bringing fuelwood down from the forest; female education creating changing expectations among people of all generations; and the prospect of improved road transport generating expectations of bigger marketing efforts and higher cash incomes.

One consequence of change is in perceptions of livestock profitability. Those households whose men are involved in non-farm work are selling off their goats and sheep and retaining cows that can be managed by the women at home. Some households contract out livestock care to professional shepherds (*gujars*), but the cost of that option also seems to be rising. The practice in the past was that the *gujar* family would retain the butter and milk produced from the livestock; the situation now is that *gujars* ask for about 4 kg of wheat grain and Rs 10 in cash for each goat or sheep for a five-month period.

Sherqilla was the first village in which the women organized themselves along the lines of the VO. This happened in June 1983, only four months after the first VOs had been formed in Gilgit. It is important to note that Sherqilla has a 'model school' for girls managed by the Aga Khan Education Services (AKES). Almost all the teachers in the school came from other districts of Pakistan, mostly Karachi, and this might have influenced both men's and women's thinking in Sherqilla. From the very beginning, men and women collaborated in managing income-generating projects; the men being particularly useful in purchasing inputs and marketing in a society where women cannot go to markets outside the village.

In addition to the VOs in Sherqilla, the village had four cooperative societies functioning in 1985 (Hussein 1985). These societies had memberships of 37, 42, 106, and 500 individuals. Together, they had equity and share capital of Rs 600,000; this compared with Rs 111,000 saved by the three VOs by mid-1985. In comparison, the land development loans, provided to the three VOs by AKRSP, totalled Rs 764,000—slightly more than the amount saved by villagers in all their cooperative bank accounts.

Of the four cooperatives in Sherqilla, two appear to be multipurpose societies. The third is for agricultural development and the fourth is a transport society. Many of the investments of these cooperatives have been in non-agricultural activities, particularly consumer shops. Most of these efforts, however, have led to financial loss.

In some cases, these cooperatives have taken out loans from the Federal Bank for Cooperatives at 9 per cent per annum, and reloaned the money to individual members at 12 per cent. The repayment record of the village as a whole is unblemished (Hussein 1985). One way in which the village effects timely repayments is by borrowing from one cooperative to pay off the other's loan. Since cooperative profits are shared by all members, villagers are also particular in repaying their individual obligations to the cooperative. Another incentive for prompt repayment is the significant interest rate of 12 per cent charged by the cooperatives; villagers are well aware that outstanding amounts are subject to this rate of interest.

Thus, Sherqilla shows a considerable variety of institutional and financial mechanisms for income generation and market exchange. It appears to have initiated the transi-

tion from a subsistence to commercial economy before AKRSP's arrival. The following points are worth noting.

(1) The villagers had started to apply the spirit of their traditional cooperation to the evolving market economy even before AKRSP arrived on the scene. Most of the cooperative activity, however, seems to have been for the benefit of a minority of the households.

(2) While villagers perceived the benefit of investing in non-agricultural activities, these activities ran at a loss. This would suggest that: (1) although villagers may have the financial assets to invest in non-farm activities, they do not yet have the expertise to be entrepreneurs outside the farm economy or (2) the organizational forms chosen by them (i.e., the cooperatives) to raise capital (through equity and concessional capital) may not be appropriate for the management of non-farm enterprises.

(3) Villagers demonstrated the potential for undertaking new income-generating activities for women by building upon the traditional gender division of tasks. Women's awareness of their collective income-generation potential might have been heightened by their socialization with women from outside the village.

(4) The response to AKRSP's insistence on collective management may have been conditioned by the presence of alternative opportunities for income generation available to the villagers of Sherqilla.

*Thingdass*

Thingdass is a hamlet-offshoot of Singal Village, the headquarters of the Punyal-Ishkoman Subdivision. It lies at an altitude of about 2,000 masl, some 55 km from Gilgit Town along a dirt jeep-track. It has 42 households belonging to the Ismaili sect. References on Thingdass include: Khan (n.d.), Sakhi (1987), and Semple (1986). Organizations active in Thingdass include the Union Council of the LB&RD System; Aga Khan Education Services; Aga Khan Health Services; the Ismailian Local Council; and the VO and its women's group.

Thingdass was established by a relative of the *Rajah* of Punyal but soon attracted other residents who were given the right to develop the land not given by the *Rajah* to his relative. Whereas the *Rajah's* relative had commissioned the first irrigation channel, subsequent settlers extended the irrigation in the village. Now, irrigation and land are subject to the same rules and conventions that operate on such communal assets in other villages; these resources are no longer considered private property.

Thingdass and Singal, together with a neighbouring village, have access to one of the largest *nullahs* in the district. This *nullah*, however, has been subject to the same kind of overexploitation and depletion that has afflicted other such resources. It is under the control of the Forest Department. Fuelwood and timber collection have become increasingly expensive in the face of longer distances to travel and rising time costs. In response, villagers in Thingdass are planting woodlots within the settled village. Rising time costs and the availability of market substitutes have also led villagers to abandon the cultivation of barley and potatoes in the lower reaches of the *nullah*. Thus, like so many villages with access to non-farm employment and markets, Thingdass is moving away from pastoralism. Virtually none of the men now take their livestock up to the pastures, and there is no longer a rota system to perform that function. The pastures are used by *gujars* who bring their herds from other villages. It is reported that these *gujars* pay toll

for the use of the pasture, at the time of the return migration from the pasture, and that this fee is collected by the *numberdars* and divided equally among all households.

Thingdass and its parent village, Singal, are subject to the constant threat of mudflows destroying their channels in mid-season. This represents a substantial risk to agricultural production in both villages. It is not surprising, therefore, that the two villages have an arrangement under which each provides labour to the other in times of emergency. Pooling labour in this manner provides insurance against massive crop failure due to lack of water for irrigation. Villagers report that, in the last 10 years, Thingdass has called upon its neighbours three times and repaid the obligation four times. Villagers also remember a mudflow that required the services of 900 men for three days, meaning that they mobilized more labour than was required for the entire PPI project (an irrigation channel).

The PPI for Thingdass was the extension and widening of an existing irrigation channel. A previous attempt at this, financed by the LB&RD Department, had failed because of poor alignment. The piers left behind from that attempt were used in the AKRSP-sponsored project. Since the completion of the channel, the VO has taken a land development loan from AKRSP. More than half the new land is to be planted with forest trees.

All the VO specialists in Thingdass are active. The plant protection specialist has worked recently in collaboration with the government's Department of Agriculture. Thingdass also is home to 10 of the hybrids introduced as part of the Heifer Project.

## CONCLUSIONS AND GENERALIZATIONS

### A Model for Sustainable Resource Management: Combining Community Organization with Sustainable Production

The focus of this paper has been on institutions rather than individuals and on changing rather than static institutions. Village and project management systems were described as institutions that may change themselves and the allocation of resources they manage. Such changes are responses to rapid and pervasive change in markets, technology, and the macro-institutional framework of Gilgit. The region is best characterized as being in transition from a traditional, subsistence-oriented, low-income equilibrium to a more modern, commercial, high-income equilibrium. There are signs, however, that the new equilibrium may not be sustainable, at least in terms of the welfare derived from natural resources. These signs have been registered by some of the VOs sponsored by the AKRSP; these VOs have initiated some instructive course-corrections that may enhance the sustainability of the evolving equilibrium.

It is suggested that, in an environment of rapid change, the VO could provide the missing link between income generation from natural resources and their sustainable management—*provided that* the VO can internalize the costs and benefits of resource use. The VO will acquire the capacity to accomplish this if:

- it can devise appropriate rules and conventions governing its members in their use of and investment in various resources; and
- if it can obtain the technology and other inputs required for sustainable resource management at a high level of productivity.

Although institutional and technological innovations appear as complements in the preceding paragraph, AKRSP's experience demonstrates that institution building should precede the delivery of technology. In other words, the investment in technology could be more productive, more equitable, and more sustainable if it is secured by an effective management system. Thus, sustainable and productive resource management is seen to proceed in two broad phases. In the first phase, the community of users adopts the institutional mechanisms needed to internalize the costs and benefits of resource use. In the second phase, the new institution needs to adopt what might be called a sustainable production model. The models of community management and sustainable production together make up the model for sustainable resource management.

The preceding conclusion is analogous to the suggestion made by the World Bank (1987) and adopted by AKRSP (1987b) that AKRSP's successful institutional model needs to be complemented by a well-articulated production model. The emphasis in the present discussion, however, has been on models of community management and sustainable production for natural resource management, neither of which have been operational except on an experimental basis. The remainder of this chapter seeks out operational guidelines for effective interaction between project management and village groups. The next section looks at the subject from the point of view of what could be done by project management, and the final section analyses village responses to project initiatives.

## Operational Guidelines for Models of Community Organization and Sustainable Production

### *Four Broad Concerns for Project Management*

When institutions and markets are changing rapidly, how can a development project help villagers respond to change in a productive, equitable, and sustainable manner?

In many Third World communities, market pressures and other changes have led to rapid depletion of resources and the alienation of resource benefits from the host (biological and socioeconomic) environment. Planning and intervention by governments has not kept pace with the pressures of change. In many locations, traditional user groups have responded, sometimes with outside assistance, by devising alternative models to those favoured by governments. There are, indeed, models of community organization, land use, silvicultural practice, pasture management, marketing, etc. For simplicity, the following discussion groups together all aspects, other than community organization, into the category of a model of sustainable production.

The preceding section has argued that community organization is a fundamental component of sustainable resource management. It also argued that a model of sustainable production is a necessary complement to models of community organization. These thoughts will now be re-stated in positive rather than normative terms in order to yield guidelines for development projects. In broad terms, the concern with operational guidelines in the following lines is directed at:

- methods of inquiry and planning;
- resource management systems for the future, particularly models of community organization;

- production possibilities for the future; in particular, approaches to articulating a model of sustainable production; and
- methods of communication.

*Methods of Inquiry and Planning*

There is now widespread recognition that some of the conventional approaches to research and planning are inefficient at using local knowledge and expertise and may lead to ineffective or counter-productive development interventions. Alternatives include several research and planning approaches that are farmer-oriented and cost-effective. Some of the approaches used by AKRSP are discussed in Husain (1987a). The important elements of these approaches include:

- the recognition that the community of villagers represents a source of knowledge and expertise for action research and planning;
- the use of careful cost-effective methods of data collection, such as semi-structured interviewing and short formal questionnaires (where quantification is essential); and
- the identification of household and village priorities, resources, and opportunities through interactive consultation with villagers.

In essence, these approaches attempt to combine local knowledge and traditional practice with scientific knowledge and modern practice. This has also been the desired goal at AKRSP. There is a need, however, to clearly identify the areas of comparative advantage for villagers and outside experts. For instance, villagers often have an extremely good idea about their priorities and resources and about existing markets (through information on prices) and traditional technology, but, in a changing environment, outside experts may have a better idea about technological options and potential markets. The two sources of knowledge and expertise can be combined in field work through:

(1) Informal methods of inquiry, including site visits and dialogues in the project area as a whole;
(2) Structured long-term monitoring for impact, to observe emerging technologies and management systems, with well-defined indicators and feedback loops, in a small number of villages. This would have two objectives:
    (a) to identify regional trends in order to articulate regional planning needs, so that the project may make informed judgments from time to time on the reallocation of its resources; and
    (b) to identify and help disseminate institutional and technological innovations.
(3) Research to adapt emerging technologies and institutions to the widest possible range of conditions in the project area. The objective is to design replicable models of development, with appropriate institutions and technologies.

*Management Systems for the Future*

Some important lessons have been learned, from AKRSP's experiences with collective management, regarding the kinds of activity that are suitable for collective management rather than control by individuals. These lessons suggest that:

(1) The VO has the potential to be the **manager of natural resources**. Thus, the VO could play a pivotal role in the transition from feudal authority to open access to common property;
(2) The VO is a versatile **service contractor** since it can:

(a) exploit economies of scale in marketing and input supply; and
(b) facilitate division of labour and specialization by enabling markets to be created in the village where none might have existed before.

(3) **Production units** that are not traditionally common property represent a formidable challenge to collective management. Here, the VO's record is mixed; while there are potential economies of scale to collective management, there is also the distinction between owner and manager that makes it difficult for the VO to manage a unit as efficiently as a single owner-manager might; and

(4) Women are fast emerging as farm managers as men take up off-farm employment opportunities; while this represents a departure from the traditional division of labour, there is little evidence of an increasing role for women in decision-making over common property. Eventually, however, full adjustment to the new circumstances might be consistent with a much greater role for women over natural resources that are traditionally common property.

AKRSP has a studied approach to institutional innovation. In essence, it makes suggestions to villagers based on prior experience in the project area, documents how the villagers respond, and helps disseminate working models that appear to be productive and equitable. Thus, the evolution of management systems for the future is seen to be a learning process for AKRSP and the villagers. There is no blueprint for institutional development.

*Articulating a Model of Sustainable Production*

Just as there is no blueprint for institutional development, it is difficult to make generalizations concerning terms of a production model suitable for a range of conditions. There are, however, elements of a minimal framework for planning towards a sustainable production model. These elements include:

- developing an **awareness of technological options** available in the project area and elsewhere in similar environments, with particular attention to interactions in the use of various resources;
- **analysing markets**, particularly those subject to change; in the Gilgit context, both output and labour markets are subject to rapid change and reveal the shape of things to come;
- identifying groups of villages or valleys in which particular combinations of resources, technology, and markets can have broadly similar results; in other words, delineating broad **recommendation domains**; and
- maintaining a **balance between** activities that have a **short-term pay-off** (and, thus, can help sustain a community in its collective endeavours) and those with a **long-term pay-off**.

It needs to be emphasized that community action for conservation is seldom forthcoming without the prospect of gain. Thus, the sustainable production model should be able to deliver increases in domestic consumption or market sales within a time frame that is valued by the community.

In the Gilgit context, villages across the district are becoming increasingly differentiated in the way in which they exploit natural resources. There are, however, indications of comparative advantage at a sufficiently disaggregated level to enable AKRSP to develop a menu of production programmes from which VOs can choose the most appropriate

options. At the present time, AKRSP is engaged in experimental work on pasture management and valley/watershed planning. Detailed reports by consultants and its own staff are beginning to give direction to the biological component of the sustainable production model. Thus, for instance:

- it is recognized that while new forestry plantations will have to be multipurpose, fuelwood is a priority in upper Hunza and fodder is important in central Hunza;
- it is felt that slow-release nitrogenous fertilizer can increase the effectiveness of fertilizer use on the leaching soils of the area;
- there is discussion about the balance of effort at AKRSP between fodder crop development and pasture development in terms of their contributions to livestock development; and
- there is consideration and testing of a number of options that could make it worth the villager's while to control free grazing and use the land for more productive purposes.

Over time, there is a need to develop many such interventions in response to changes in the region's economy. Each technological intervention demonstrates, too, the challenge to institutional innovation. Addressing the two simultaneously will help AKRSP articulate effective strategies for resource management in the region.

*Methods of Communication*

Technologies and institutional arrangements passed down to villagers from preceding generations are often described in terms of rules of thumb and conventions. These rules of thumb—many of them expressing quantitative relationships—are simple and clear and can be transmitted cheaply and widely. If innovative practices are to be extended to farmers, they need to be backed up by a strategy of communication that is at least as effective as traditional methods.

Where research funds are small and farmer literacy is low, highly specific recommendations, conditional on continuous variables, may be prohibitively expensive to develop and disseminate (Byerlee 1986). Thus, simplicity in recommendations has particular value in a place like Gilgit and would imply priority to:

- general recommendation, of which a single recommendation is made for all farmers in a recommendation domain, and,
- next in priority, recommendations conditional on discrete rather than continuous variables, e.g., fertilizer level × soil type or crop, rather than irrigation × soil moisture percentage.

If simple and clear recommendations are available, they need to be communicated repeatedly to the farmer, particularly at the 'right' time and in a cost-effective manner. In the past, AKRSP has used the following extension media:

- model farmers and village plant protection specialists trained by AKRSP;
- village meetings and dialogues;
- demonstration plots in the villages;
- Urdu language leaflets; and
- meetings of village representatives held in Gilgit.

In the future, extension efforts might also benefit from the addition of an audio-visual unit and the commissioning of a radio station in Gilgit capable of covering the entire district.

There is a need to focus particularly on communications with village women. One report after another at AKRSP has identified the problems that AKRSP has faced because its field staff are men. AKRSP has been recruiting women to its district-level staff, and these women professionals go on extensive field tours in support of the extension efforts of particular technical sections. Nevertheless, Social Organization Units, based in the villages, remain a male preserve. Since these units are the coordinators of efforts at the field level, and since they are the primary means of two-way communication between AKRSP and the villagers, the absence of women from these teams must be counted as a serious weakness in AKRSP's approach to women in development. While such conclusions have been put forward to AKRSP on a number of occasions, there are delays in formulating appropriate remedial measures. This is unusual for AKRSP and is probably due, in part, to the difficulty of recruiting appropriate female staff.

## Questions for the Future

There are parallelisms between AKRSP's response to change and that of the villagers with whom it works. Both AKRSP and the VOs explicitly recognize the need for innovation as a response to change. If markets, technology, and the macro-institutional framework remained static, there would be no payoff to innovation; in particular, there would be no incentive to change traditional patterns of resource allocation and traditional resource management systems. Conversely, where change is greatest, the opportunity for innovation is greatest. The perception of change, and of priority in the reallocation of resources, however, may differ between AKRSP and the VOs, as well as among the VOs.

AKRSP offers a development package that combines collective management with agricultural production and marketing; it does not finance individual enterprise, nor does it sponsor non-agricultural activities. AKRSP is not, therefore, a programme for regional development; it is a small farmer development programme. This raises a fundamental question about future directions for village development: what ways and means will the VO employ in the future to manage its resources in order to respond to all (not only agricultural) opportunities for development? Can one expect equitable and sustainable increases in resource productivity if large portions of economic activity are left outside the planning and coordinating roles of the VO?

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# 30

# MOUNTAIN AGRICULTURAL TECHNOLOGY DEVELOPMENT AND DIFFUSION: THE LUMLE MODEL, NEPAL

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**CONTENTS**

## INTRODUCTION

This paper describes the strategies and methods used by Lumle Agricultural Centre (LAC) to identify, generate, verify, and disseminate agricultural technologies for the Western Hills of Nepal.

Managerial flexibility, continuity of funding, staffing, and strong administrative backup for staff are identified as important institutional requirements for a successful project in a difficult environment.

A multidisciplinary, farming-system, farmer-participatory approach to problem identification and technology generation and verification is used in achieving its goal of providing farmers with relevant technologies in a usable form. Strong linkages with Nepal's Research and Extension Services at national, regional, and district levels are necessary for wide dissemination of technologies in their appropriate recommendation domains.

### The History of Lumle Agricultural Centre

The hills of the Western Development Region of Nepal rise from the sub-tropical *Terai*[1] at 300 masl to the Arctic heights of Annapurna and Dhaulagiri Himal which are over 8,000 m. In the low hills, three crops a year are possible. Cultivation of potatoes, barley, buckwheat, and amaranthus is carried out up to 3,000 m, and migratory sheep flocks graze the alpine pastures up to 4,500 m. The people of the area are mostly smallholders, peasant farmers renowned for their industriousness and hardiness. The mid and high hills are a traditional recruiting ground for the world-famous Gurkha soldiers.

In 1968, a resettlement scheme was set up in the foothills of the Annapurna to retrain retiring British Gurkhas in agricultural skills. It was soon evident that training alone was insufficient. Technologies to improve the traditional farming methods, a supply of inputs, and advice at field level were also required to ensure successful re-integration into agriculture. It was as a response to these needs that Lumle Agricultural Centre was born, with the responsibility of providing research, extension, and training services to the farmers of the western hills. Starting with a relatively small command area of 1,000 $km^2$ (15,000 farming households), Lumle Agricultural Centre expanded steadily and now serves 18,600 $km^2$ (350,000 farming households). Previously an isolated project, it is now part of the national network of agricultural research stations coordinated by the National Agricultural Research Centre (NARC).

### The Objectives of Lumle Agricultural Centre

The major technical objective of LAC is to improve the productivity and income of farmers through the generation, verification, and dissemination of relevant, sustainable technologies. At the same time, LAC is seen as a centre of excellence for the training of national scientists and the pioneering of research and extension methods suitable for hill agriculture. This Centre is now able to demonstrate that mountain farming, including

[1] The lowland and southern plains of Nepal, bordering the Gangetic plains of India.

crops, horticulture, livestock, and forestry, can offer a sustainable livelihood for the farmers of the mountain regions of Nepal.

## The Context

A more difficult physical, social, and institutional environment in which to carry out development work would be hard to imagine. Paradoxically, this very fact may have contributed to the success of LAC in attracting good quality funding and a team of national scientists dedicated to equalling the challenges set by the environment.

Fig. 30.1 shows the location of LAC, centrally situated in the Western Region of Nepal. The few motorable roads that exist are all marked. The research command area of LAC includes the sub-tropical low hills bordering the *Terai*, the warm and cool temperate middle hill region, and the alpine pastures and Arctic snowfields of the high Himalayas.

Differences in altitude, aspect, slope, and soil multiply the agricultural 'niche' manifold. Annual rainfall varies from 1,500 mm to over 5,000 m. High rainfall, fragile soils, and steep slopes combine to produce landslides, even in well-forested areas.

The area depends upon agriculture, tourism, and military service as the mainstays of the rural economy. Agriculture accounts for 55 per cent of the National GDP and 93 per cent of the population live in rural areas; the majority of these depend upon agriculture for their livelihood. The hills, which contain about 50 per cent of the country's 18 million people, support an average of 5.3 persons per cultivated hectare (World Bank 1989). This is comparable to that of deltaic Asia, a major difference being that in those regions three crops per year are possible, whereas in the hills of Nepal many areas can support only one or two crops per year (Balogun et al. 1988).

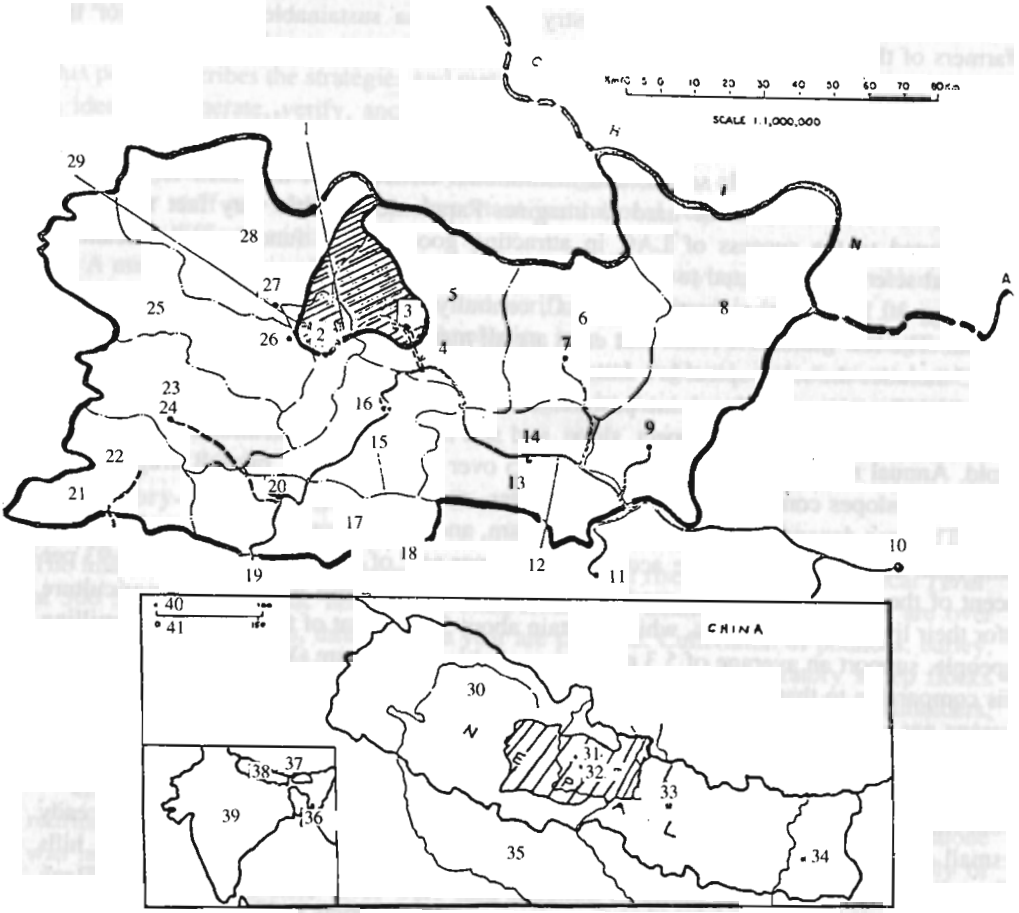
The population in the hills continues to rise by about 1.5 per cent per year, despite out-migration to the lowlands and the towns (World Bank 1989). As a result the already small and fragmented farms are further split. Seventy-five per cent of farmers in the hills have less than 1 ha of land to farm and 50 per cent have less than 0.5 ha (World Bank 1989). Thus it is not surprising that the majority of hill districts in Nepal are food deficit areas (i.e., net importers of food) for one or more months of the year.

The resources available to farmers in terms of land, capital, income or underutilized labour are very meagre. GDP per capita is US$ 160 per annum.

In Nepal, and particularly in the hills, farms rely on a complex and complementary mixture of enterprises to spread risk and to provide the bare necessities of existence (Fig. 30.2). The forest provides fuel, timber, fodder, and some food and cash products.

Livestock often depend upon tree fodder and grasses from the forest. While ruminants provide milk products, meat (in the case of buffalo), and draft (in the case of cattle) they are also most important as sources of manure and as an insurance policy for times of need. Manure is the major source of nutrients for crops, inorganic fertilizer use being minimal except for those few areas enjoying good access or unusually intensive development.

In Western Nepal, the majority of farmers live in villages and social cohesion is strong. However, there is social stratification both on the basis of relative wealth and on the basis of caste. Thus, the adoption of any technology depends not only on its relevance to the agro-ecological conditions of the area, but also on the socioeconomic status of individuals within a community.




1. Tapu (FSR)
2. Parbat Kusma
3. Lac
4. Pokhara
5. Kaski
6. Lamjung
7. Besisahar
8. Gorkha
9. Gorkha
10. Kathmandu
11. Bharatpur
12. Yampaphant (FSR)
13. Tanahun
14. Damauli
15. Syangja
16. Syangja
17. Palpa
18. Kewre Bhanjyang
19. Butawal
20. Tansen
21. Arghakanchi
22. Sandhikharka
23. Gulami
24. Tamghas
25. Baglung
26. Baglung
27. Beni
28. Myagdi
29. Lopre (FSR)
30. Jumla
31. Pokhara
32. Lac
33. Kathmandu
34. Dhankuta
35. India
36. Bangladesh
37. Bhutan
38. Nepal
39. India
40. Miles
41. Kilometres

**Figure 30.1: Map of Lac extension and research command areas**
*Source:* Lumle Agricultural Centre.

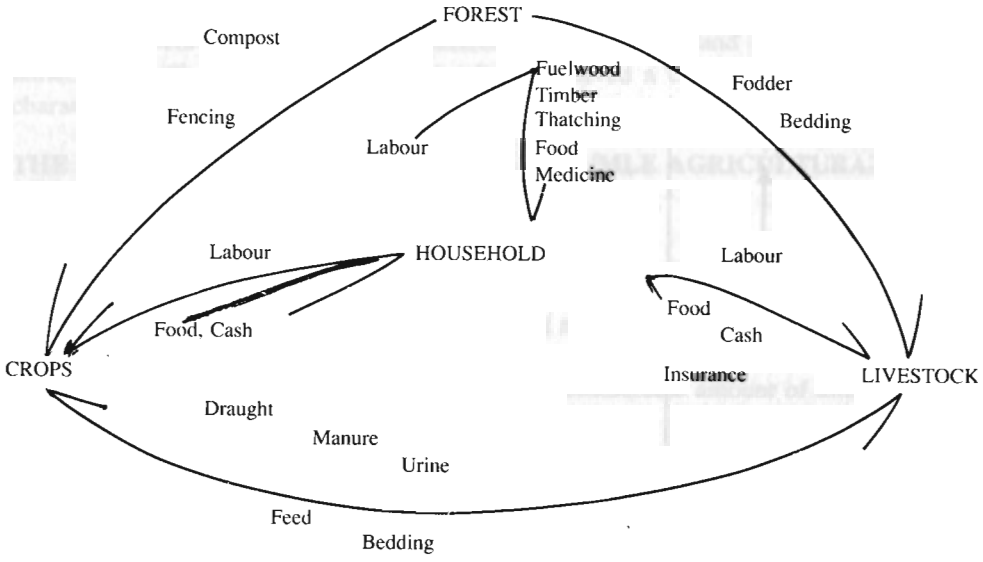



**Figure 30.2: A simplistic diagram of the traditional Nepali hill farming system**
*Source:* Lumle Agricultural Centre

Village communities are changing even in remote areas. Most children have access to schooling, and migration and off-farm employment are bringing new ideas and resources from outside. Government services are affecting an increasing proportion of farmers, and 'development', as measured by the quantity of services per head of population, is progressing steadily.

LAC is part of that development process. The approaches it has evolved in order to control the quality of development due to its interventions form the main theme of this paper.

## CONSTRAINTS AND FACILITATORS OF DEVELOPMENT IN THE NEPALESE HILLS

It would be wrong to say that LAC has ever had a deliberate policy of minimizing constraints and exploiting the factors that facilitate development. However, as LAC has evolved it has recognized these opposing factors, through close association with its working environment, and modified its approach accordingly (Fig. 30.3).

### Constraints

The constraints inherent in the working environment are:

- the increasing population;
- the immense logistical difficulties of working in an area with few roads or services and a highly dissected terrain;
- the meagre resource base, in terms of cultivable land, good quality communal land, soil fertility, capital or liquid assets, professional skills, and available labour;

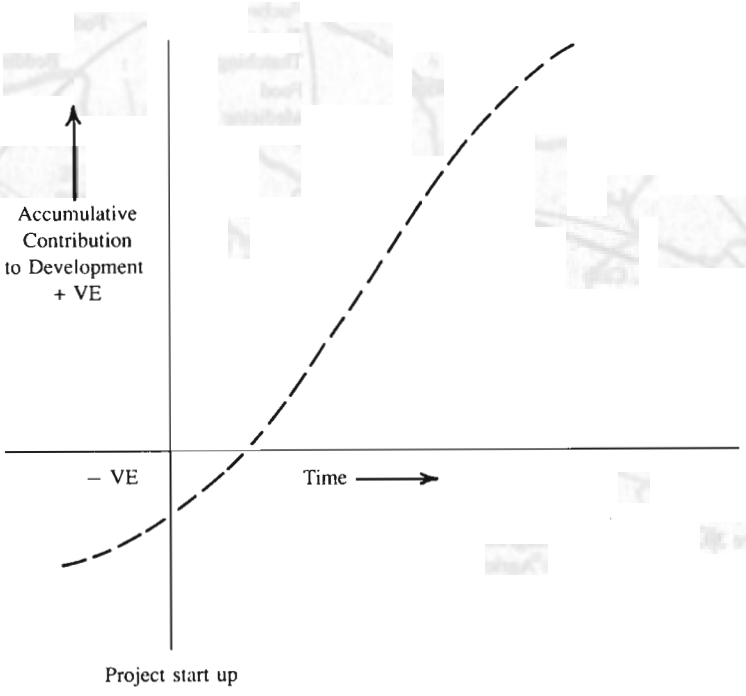



**Figure 30.3: A representation of the contribution of donor-supported projects to development with time**
*Source:* Lumle Agricultural Centre (LAC)

- the paucity of local and urban markets, due to a limited population with adequate purchasing power, and the difficulties of international marketing for a landlocked country restricted by its neighbours; and
- the extreme edaphic, climatic, ethnic, and economic diversity of the area.

## Facilitators

In contrast to these negative factors, the following must be acknowledged as factors aiding the development process:

- the majority of land is owner-occupied;
- there is good social cohesion and a tradition of self-help;
- labour is cheap by international standards;
- the rural population is receptive to relevant technology;
- there is a considerable inflow of income into rural areas from off-farm sources; and
- the diverse conditions create a wide range of opportunities.

In order to address the problems of the western hills and to exploit their compara-

tive advantages, a favourable institutional environment must be created. Only then can appropriate technical solutions be generated. Partly by chance and partly through a sustained team effort, it is thought that LAC has evolved a combination of institutional characteristics that favour development.

## THE INSTITUTIONAL ENVIRONMENT AT LUMLE AGRICULTURAL CENTRE

### Location

Initially the siting of LAC, 30 km from the nearest road, (accessible by road now) ensured from the start that there was good contact with the local population and appreciation of the logistical difficulties. Even now all staff spend a considerable amount of time travelling by foot around the command areas of the Centre.

### Continuity

Many projects and programmes will have only just emerged from their start-up phase by the time the donor funding runs out. Their contribution is often minimal and could be negative.

Time is required to understand the local conditions, to set up an infrastructure, to initiate working procedures, to build a team of technicians and supporting staff, and to gain the confidence of farmers and local leaders.

While continuity of funding is important, continuity of staff is equally vital. This is true for administrative, technical, and field staff, so that all feel part of a stable but progressive entity.

In order to achieve continuity of staffing, the terms and conditions of service must be adequate and the work professionally satisfying. The first is met by providing good housing, facilities, a good remuneration package, good training opportunities, and a good working environment. In return staff are expected to devote all their energies and abilities to the job in hand.

### Administrative Support

A strong administrative section takes much of the day-to-day administrative burden from the technical staff. While the administrative section is on a par with technical sections, it does not dominate, and section heads are responsible for their own budgets, staff management, and programme planning. Administration supports but does not control. Thus, LAC can be described having a professional meritocracy, rather than a bureaucracy.

### Funding

- *Continuity.* The agricultural calendar does not include a three-month break at the end of the financial year. Thus, funding must be available throughout the year for programmes to retain their momentum.
- *Long-term commitment.* For any sort of medium or long-term planning and implemen-

tation of programmes there must be security of funding and a declaration of support from both the funding agency and the recipient government.

- *Flexibility.* In-built mechanisms for financial management flexibility at LAC allow the programmes to respond to the dynamic situation with which they are dealing. In this context, it must be recognized that the project is there to respond to the requirements of the farmers, not to mould the farmers to its planned 'model' of development. In fact, the LAC model can be seen to be a response to the requirements of the hill farmers.
- *Direct funding.* The three ideals of continuity, security, and flexibility of financial management are rarely found in development projects. They are made possible because the Centre is directly funded by the British Government. The project director is responsible for the management of the funds, and is fully accountable to the British Government. Within clearly defined limits the director is able to use the funds to the best advantage of the project. It is this degree of on-the-spot control that allows management to be effective and supportive to the development process.

**Staff Support**

To maintain the vital contact with farmers the staff of LAC must regularly travel on foot to some of the most remote areas of Nepal. These areas are often food deficit areas so food supplies must be taken. The treks must be carried out in the snow during winter and in the torrential monsoon during summer. Staff must be well equipped for such expeditions, they must be supported by a cadre of well-disciplined porters, cooks, and camp managers, and they must be given adequate financial incentive to compensate for the hardship and expenses incurred. These conditions apply equally to field-based extension staff and Centre-based research and training personnel.

All senior (graduate) staff at LAC are issued with a tent, sleeping bag, and sleeping roll, and are expected to use them. Indeed promotion and training opportunities are partly determined by 'trek performance'. Trekking allowances are adequate to cover food, clothing wear and tear, and incidental expenses such as courtesy cups of tea for village leaders.

**National Integration**

For much of its 22-year history, LAC was independent of the national mainstream development process. Over the last five or six years this has changed so that the Centre is now an integral part of the National Agricultural Research Centre's network of research farms and stations that cover the whole of Nepal, while still maintaining its integrity and character. The Centre bases its overall programme on national policy as embodied in successive Five-Year National Development Plans, and is in constant dialogue with the national, regional, and district HMG/N representatives of the Ministry of Agriculture, Forestry and Soil Conservation, and Land Reform and Management.

This ensures that the efforts of LAC do not duplicate or contradict the efforts of HMG/N, while at the same time ensuring that the work of LAC is understood and approved at all levels and that, where relevant, the recommendations or methodologies developed by LAC can be widely adopted.

## TECHNICAL STRATEGIES

### The Lumle 'Model' for the Hills of Nepal

In the previous section we have seen that a solid institutional foundation is in place at LAC. This enables the technical staff to carry out their work in a conducive institutional environment.

The next important factor in LAC's model is its comprehensive understanding of the field conditions for which technologies and approaches are being generated for the hills. This is because LAC has been providing extension services for some 15,000 farming households for 15 years. In addition, researchers and trainers carry out much of their work in the rural areas. The roles of researcher, extensionist, and trainer have often overlapped considerably.

The third major structural component in the Lumle model is the participation of farmers in research activities. Of all trials and studies carried out by LAC, between 65 and 75 per cent are carried out on farmers' fields, using farmers' labour. This trend is increasing and we are constantly looking for research approaches that involve the farmers at an ever earlier point in the technology selection process. Two recent examples of this are: Informal Research and Development, in which small packets of advance line seed materials are distributed in remote areas otherwise untouched by research and extension activities, allowing farmers to make their own selection of varieties, and Farmers' Preference Ranking, in which the farmers' preference for varieties is quantified as a complement to the measurement of biological parameters such as yield and time of maturity.

The fourth vital component of the Lumle model is its multidisciplinary approach to research. This has been a fundamental feature in ensuring the relevance of any technologies generated to the overall farming systems of the hills, and reflects the interdependence of all the major components of the farming system at the farm level as shown in a simplified form in Fig. 30.4.

The fifth component is the fact that research, extension, and training are all carried out by the same institution. Each supports the other and there is a synergistic effect resulting in an organisation that is both solid and dynamic.

### The Research Process

The research process consists of a number of continuous stages, which are: identification of the problem, technology generation, verification, dissemination, modification, and monitoring (which leads to further modification). At LAC, each stage has been critically examined in the context of the development of approaches thought to be suitable for the conditions in the hills. Several of these approaches are now being adopted at a national level.

### Identification of the Problem

Within national policy guidelines, and in consultation with national, regional, and district officials, a broad work programme is drawn up each year, and this is prioritized according

to the impact each area of work is expected to have. The prioritization stage requires further strengthening through the setting up of a computerized database.

In order to understand the farmers' problems and to ensure the relevance of any research programme, a special type of Rapid Rural Appraisal has been developed by LAC and its sister organization Pakhribas Agricultural Centre. This is called the *Samuhik Bhraman*. The term means 'travelling together'. Normally, LAC research staff, scientists from the national programmes, and staff of the District Extension Services make up the multidisciplinary team. They work together on a common theme that can be general or specific. In addition to clarifying the issues facing farmers amd learning from them, the *Samuhik Bhraman* is an opportunity to strengthen personal links with individuals of other organizations working in the same area of research (Chand and Gibbon 1990).

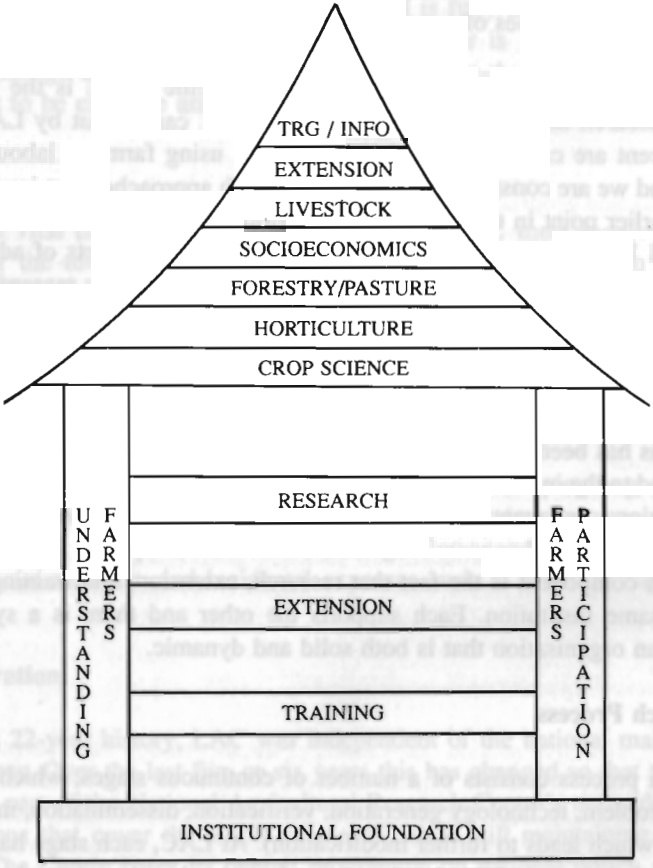


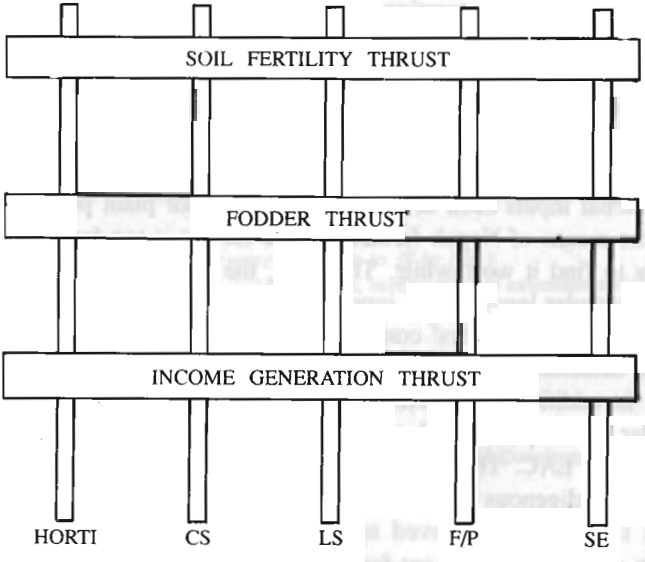

**Figure 30.4: The Lumle model for the hills of Nepal**
*Source*: Lumle Agricultural Centre

One consequence of the use of *Samuhik Bhraman* at LAC has been the identification of three major themes (research thrusts) that require special attention in the hills. These are: (1) the maintenance and improvement of soil fertility, (2) the improvement of the availability of fodder, and (3) the identification and encouragement of income-generating activities. These activities are now incorporated into LAC's programme and supplement

the 'conventional' single discipline research by providing a mechanism whereby cross-disciplinary research can be carried out. Each thrust has a coordinator and volunteer members from most technical sections. The thrusts have their own programme for research and their own budget, and concentrate on problems that involve expertise from two or more sections such as the use of crop residues as livestock feed or the use of forest litter in the production of compost for crop production (Joshi et al. 1990).

## Technology Generation

Many research stations have relied on generating technologies 'within the fence' of the station and then supplying them to the extension services. This approach has long been rejected at LAC. The present approach is to carry out a high proportion of research on farmers' fields. Between 65 and 75 per cent of all trials and studies conducted by LAC are now carried out on farmers' fields using farmers' labour (Fig. 30.5). This has various advantages.




*key:* HORTI = Horticulture; CS = Crop Science; LS = Livestock; F/P = Forestry and Pasture; SE = Socioeconomics

**Figure 30.5: Cross-disciplinary research "thrusts" at LAC**
*Source*: Author

(1) Trials are conducted under farmers' conditions.
(2) Farmers' reactions can be incorporated into technology assessment.
(3) The cost to LAC is reduced.

A three-tier research network, pioneered by LAC, is now being adopted by the National Agricultural Research Centre.

Within the network, trials are carried on 'on Centre' at off-station research sites and at outreach research sites (Table 30.1). Only the first category has a permanent

infrastructure, but all have LAC-employed personnel to ensure control of the research programme and good quality research results.

**Mechanisms to Ensure the Sustainability of Technologies**

It is thought that a technology will be sustainable (i.e., used by a farmer for a considerable period of time without environmental damage or resource degradation) if (1) it fulfills a real need, (2) it is suitable for the physical and social conditions, (3) it does not conflict with other farm enterprises, (4) it does not degrade the environment, (5) it is economically viable, (6) it is significantly better then the farmers' present practice, (7) the benefits outweigh the risks involved, and (8) the necessary inputs are available.

These points are dealt with by LAC in the following ways:

(1) By ensuring accurate identification of problems through *Samuhik Bhraman* and farmer/extensionist feedback.
(2) By carrying out location-specific verification of technologies.
(3) By multidisciplinary cooperation in assessing research proposals and results.
(4) Through careful selection of technologies and subsequent monitoring of the impact of technologies on the environment (in this respect having an extension area under the full control of the Centre is a great advantage).
(5) Through (involvement of the LAC Socioeconomics Section in the) assessment of technologies—also by recognition of the limited resource base of Nepali hill farmers. Many external inputs such as chemical fertilizers or plant protection chemicals are beyond the means of Nepali farmers, or the farmer is too far away from the source of supply to find it worthwhile. Therefore, the Crop Science Section at LAC tests its varieties under low-external input conditions to ensure that varieties selected will perform well under farmers' conditions.

    Similarly, selection among local landraces of crops has now become commonplace at LAC, in addition to selection from exotic materials that usually only perform well under high-input conditions. The use of indigenous resources is given priority in research at LAC. Thus, the use of indigenous green manures, indigenous goat breeds, and indigenous fodder trees are three areas where farmers have traditional practices that can be improved upon and disseminated with maximum speed and minimum disruption of present farming practices.
(6) While statistical analysis can be done on trials that are significantly replicated and controlled, the farmer is the ultimate judge of new technology and must be given ample chance to make his own assessment. This can be done through Pre-Production verification trials (Fig. 30.6), minikits, and informal research and development packages.
(7) As for (6), cost-benefit analysis can give an indication of the economic viability of a technology, but farmer adoption will be the proof of acceptance.
(8) Seed is the major input for agronomic and horticultural crops. LAC produces foundation seeds for a very wide range of crops and uses its own extension command area as a resource area for production of high quality cereals, vegetables, and potato seeds for the benefit of the whole of the hilly area of the Western Region (see Case Study One).

| | |
|---|---|
| Farmers' variety<br>Farmers' practices | Improved variety<br>Farmers' practices |
| Farmers' variety<br>Improved practices | Improved variety<br>Improved practices |

**Figure 30.6: Pre-production verification trial (in this case to verify an improved variety)**
*Source*: Author

**Table 30.1. The LAC network of research sites**

| Facilities | Activities |
|---|---|
| | *On centre* |
| Permanent offices, laboratories, and accommodation. | Basic research, initial evaluation of new research approaches, collation, analysis and interpretation of results, coordination of off-station and outreach trial programmes. |
| Core scientists<br>Outreach senior staff | Liaison with national and international research institutions. |
| | *Off-station research sites (up to 8 by 1985)* |
| No permanent infrastructure | Basic research for environments not available at the Centre, initial verification, foundation seed multiplication, training, |
| Graduate Coordinator.<br>Junior technical staff | farmers' visits, involvement of AIC, ADB, and district staff. |
| | *Outreach research sites (up to 38 by 1995)* |
| No permanent infrastructure | Verification, involvement of extension services, focus for studies. |
| Locally employed recorders supervised by extension services and monitored by LAC-based outreach staff | |

Note: AIC = Agricultural Inputs Corporation (Nepal), ADB = Agricultural Development Bank (Nepal).

## Verification of Technologies

By the time a technology reaches this stage there has already been a considerable input of farmers' participation in the selection process. We are, therefore, cautiously confident that the technology will at worst be as good as the farmers' present practice and at best be very much superior.

Verification is carried out on farmers' fields at outreach research sites, where good quality data is required, and on farmers' fields away from outreach sites where the farmers' response data give sufficient feedback. The pre-production verification trial is used extensively for verification as it allows two-stage comparison between farmers' conditions and two levels of recommended practices. Verification is a cooperative activity between LAC research staff and the extension services, to the benefit of both parties.

## Dissemination of Technology

At LAC, technology transfer occurs at various levels. Technologies come into LAC mainly from farmers and from its own research results, as well as from institutions within Nepal and abroad. At the same time, technologies are disseminated by LAC to extension agencies, farmers, research workers, and other change agencies, including private enterprises (Fig. 30.7).

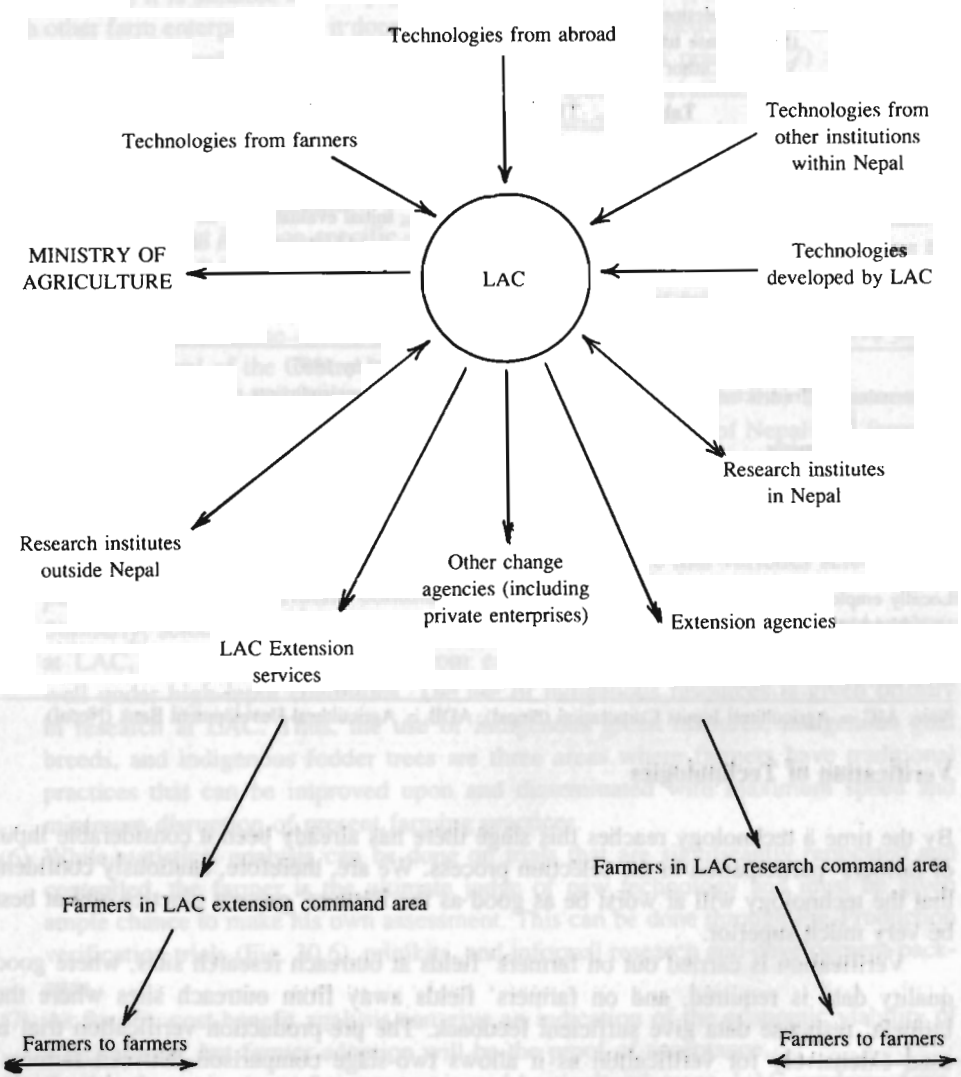



**Figure 30.7: Flow of technology in the LAC sphere of influence**
*Source*: Subedi, A. and Pound, B. *Modes of Technology Transfer in Nepal* LAC Discussion Paper No. 3, 1990

LAC has traditionally disseminated its technologies through its own extension staff with whom it has very close links and whose area it knows intimately. However, since 1987, LAC has also been responsible for research support to an increasingly large command area which will eventually include 350,000 farming households. Its clients in this case are the extension services of HMG/N and any other potential users of LAC-generated technologies So far LAC has relied mainly on six methods of dissemination (Fig. 30.8).

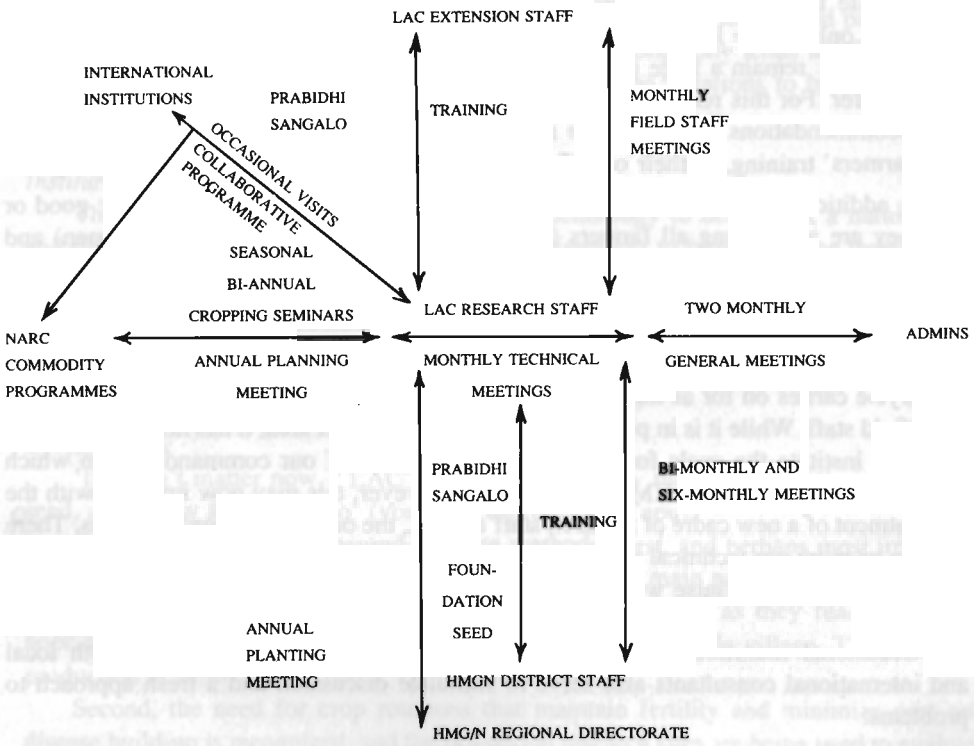



**Figure 30.8: Extension and Research Linkage**
*Source*: Lumle Agricultural Centre

(1) Bi-monthly and six-monthly meetings with district staff.
(2) Involvement of research, extension, and farmers in the verification of technologies, including minikit demonstrations. Minikits are field-scale demonstrations of a verified technology put out on farmers' fields. LAC coordinates some 3,000 minikits per year, using pre-released and released varieties from the National Commodity Programmes and from its own varietal improvement programmes.
(3) Published materials, especially *Prabidhi Sangalo* a topical newsletter produced quarterly in Nepali by the LAC technical staff. It covers proven new technologies, developed by LAC, some new ideas, farmer success stories, and hints and tips, as well as letters and poems sent in by readers. It is now in its fourth year of publi-

cation and circulation is about 2,000 copies. Very recently the Royal Nepal Academy for Science and Technology awarded the prize for Science and Technology to LAC, partly in recognition of the contribution of *Prabidhi Sangalo* to the dissemination of technology. It is becoming popular with field staff, district officials, students, and even Ministry staff because it fills a real knowledge gap.

(4) Supply of inputs, particularly foundation seeds of improved varieties of cereal crops, potatoes, and vegetables.

(5) Training of HMG/N extension staff in field experimentation methods.

Despite these varied and active approaches the fact remains that, as long as LAC relies only on the HMG/N extension services for dissemination of their technologies, there will remain a large proportion of farmers who are unaware of the alternatives on offer. For this reason, LAC is looking into alternative methods for the spread of recommendations. It is too early as yet to report on the potential of the method.[2]

(6) Farmers' training, in their own fields or villages, on various aspects of farming.

In addition LAC is looking at its own extension methods to determine how good or bad they are at reaching all farmers (including resource-poor farmers and women) and the sustainability of the methods used.

### Monitoring and Modification

This cycle carries on for as long as the technology is viable, and requires good feedback from field staff. While it is in place for LAC's own extension area, it has not been possible as yet to institute the cycle for the much larger portion of our command area in which extension is carried out by HMG/N field staff. However, this may now improve with the appointment of a new cadre of research staff at LAC, the outreach research officers. There are one or more per technical section, and their main tasks are to coordinate the outreach research programme, liaise with district staff, and to obtain feedback from district field staff.

Occasional monitoring visits by ODA advisors, NARC scientists, and both local and international consultants also serve to stimulate discussion and a fresh approach to problems.

## CASE STUDIES

The following case studies have been chosen to highlight the approaches taken by LAC, rather than to give technical details of the technologies.

### Case Study One: Vegetable Seed Production

*Introduction*

Those villages fortunate enough to be situated near roads or urban centres have opportunities for comparatively easy marketing of their surplus production. For those

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[2] This includes use of informal research and development, involvement of NGOs, involvement of schools and health services, increased use of off-station resesarch sites and outreach research sites for extension, and obtaining feedback from the district field staff.

villages one or more days' trek from the nearest roadhead, income generation from agriculture depends upon high-value/low-volume products. This was one of the reasons for introducing vegetable seed production as an income-generating activity to farmers in LAC's own extension command area, where quality control aspects could be well supervised.

*Identification of the Problem*

The technology also answered a real and growing need for good quality seed throughout the country and reflected the national policy of self-sufficiency in seed production. It also exploited the topography and diversity well. The topography lends itself to isolation of seed-producing pockets, and the diversity allows ideal situations to be selected for a range of activities.

*Institutional Consideration*

The continuity of the project allowed the technology to develop at a natural pace, and flexibility in financial management allowed payments to farmers to rise from nothing to two million rupees over five years.

Having research, extension, and training under one organization hugely facilitated the coordination of these three vital components in the development, dissemination, and implementation of the technology.

*Sustainability*

'It doesn't matter now if LAC stays or goes. I know that I must continue producing seed, and I now know how to' (young seed producer—Tapu).

Sustainability is being ensured by three methods. First, and perhaps most important, village seed-producer committees have been set up in the main producing areas. Through these, there exists a degree of internal monitoring of quality as they realize that one poor sample of seed can compromise the reputation of the whole village. The growth in production is shown in Fig. 30.9.

Second, the need for crop rotations that maintain fertility and minimize pest and disease build-up is recognized, and the off-station research sites are being used to evaluate promising 'break' crops.

Third, private enterprises are now very involved in the marketing aspects in open competition with the parastatal Agricultural Inputs' Corporation (AIC). Having initiated the process and helped make it commercially attractive, LAC's future role will be one of quality control and technical backstopping.

**Case Study Two: 'Chhomrong Local' Rice**

*Introduction*

Research and extension services neglect farmers living above 1,500 m. These areas tend to be more remote and logistics are more problematic. The major crop research stations (National Commodity Programmes) are all based in the *Terai* or inner *Terai*. It is left to LAC and the Pakharibas Agricultural Centre (PAC) and, more recently, the Hill Crop Improvement Programme to develop technologies for the mid-high hills. Over the

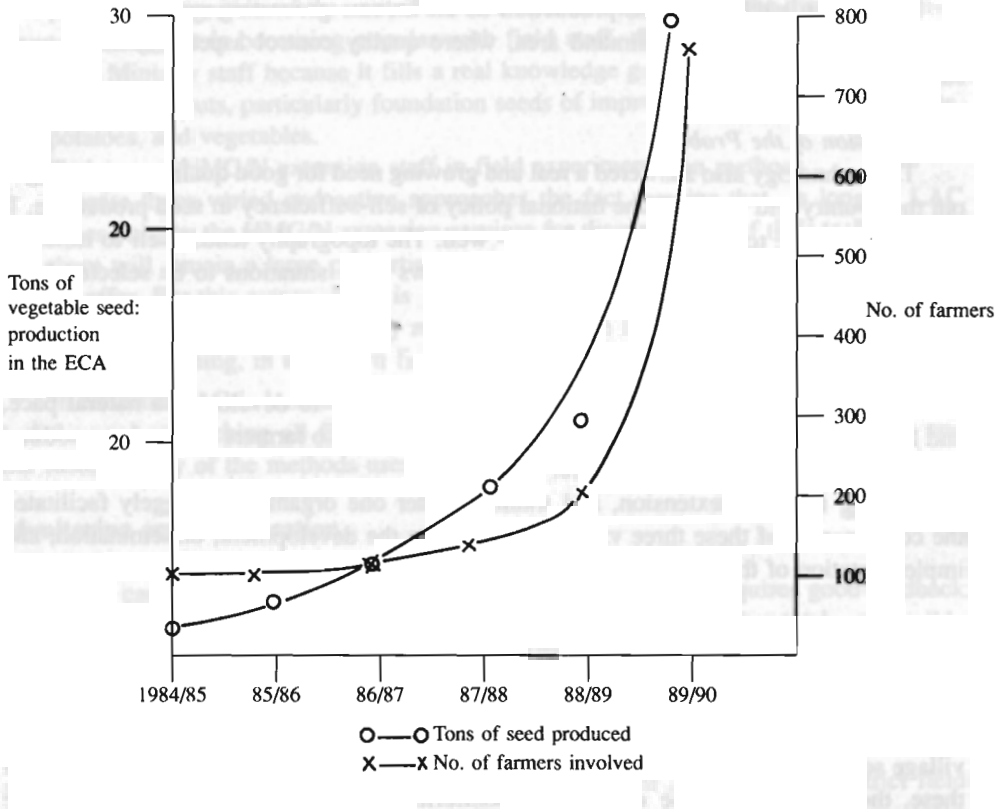


**Figure 30.9: The growth in farmers' production of vegetable seeds in the LAC extension command area**
*Source*: Lumle Agricultural Centre

last 15 years, 51 improved agronomic and horticultural crop varieties have been identified by LAC.

*Identification of the Problem*

Through farmer feedback, it was realized that there were no improved varieties of paddy rice for altitudes above 1,500 m. Due to cold air and water temperatures, most introduced varieties were at least partially sterile at this altitude.

*The Research Approach*

The approach taken was to select within the most promising local landraces and to improve them through scientific selection for yield components; farmers' selection took place in accordance with other characteristics important to them such as grain colour, cooking qualities, straw type, and length of season.

The selection process has been conducted using low external inputs such as chemical fertilizers and plant protection chemicals to ensure good performance under farm condi-

tions. The work has been carried out at different altitudes from 500 m to 2,000 m using LAC's network of off-station research sites.

The variety to excel in these trials has been Chhomrong Local. Fig. 30.10 shows that, at 1,500 m, it outyielded all other varieties and that at 2,000 m it was outstanding. Chhomrong Local is now about to be released by the National Variety Release Committee and is the only 'Nepalese' variety to be included in the International Rice Research Institute's (IRRI's) International Cold Tolerance Rice Nursery.

This case study demonstrates the need for 'market research'. What are the 'products' of research that will sell? Here a gap in the market was identified and a product produced at a price (in terms of external inputs) that the market (i.e., the farmers) could stand. To embark on such a programme, which takes up to 10 years, requires confidence in the stability of the organization and continuity of staffing. This LAC was able to provide, and the beneficiaries are the highland farmers of Nepal and the international research effort.

### Case Study Three: Sustainable Cattle and Buffalo Improvement through Village Livestock Development Committees

The large population of unproductive or under-productive cattle and buffaloes in the hills is not only a cause for concern from an ecological degradation perspective, but also a continuous drain on farmers' labour and resources.

The introduction of high-yielding animals from abroad requires large initial financial resources, a good market outlet for surpluses to justify the high inputs, adequate health services, and quality feed support.

These requirements are not available in most of the hill areas of Nepal. On the other hand, it is also necessary to upgrade the existing animal population so that production can be improved with minimum additional inputs.

Consequently, to improve the productivity from the existing indigenous animal population, LAC introduced a multidimensional approach. This includes genetic improvement by the introduction of genetically superior breeds, feed improvement by the introduction of indigenous fodder and forage species, improved use of crop by-products, health cover by trained field staff, and village-level animal health workers. Most important, these programmes were organized by the farmers' organizations or groups who have some vested interests and goals. These groups are responsible for ensuring the management and continuity of breeding programmes with very little help from LAC, apart from the initial provision of breeding materials (either bulls or artificial insemination services).

The result has been a three- to fourfold increase in milk production from crossbred cows in local environments without any additional inputs and a tremendous increase in the market value of these animals from Rs 200/local cow to Rs 6,000–7,000 per crossbred cow.

Among the present total population of 1,200 jersey-cross cattle and 1,400 cross-bred buffaloes in the ECA villages, 400 cows and 800 female buffaloes are in the productive stage. At present market prices, the total value of these animals is estimated to be about 9–10 million Nepalese rupees. In some areas, cheese factories are now being considered in order to use surplus milk and to provide more cash income to the farmers through fresh milk sales. In order to minimize environmental damage because of the grazing of large ruminants, stall-feeding is being encouraged. This is being rapidly adopted, especially

where fodder resources are being increased through the planting of fodder trees and fodder grasses (often made possible only after grazing has stopped, requiring the cooperation of the whole village as organized by the Livestock Development Committee). Hence, with minumum external input, maximum utilization of indigenous resources, and organization of local communities, maximum benefit to the farmers is being provided.

### Case Study Four: Fodder Tree Programme

The hill farmers of Nepal are dependent on tree products as an integral part of their farming system. Timber, firewood, compost, animal bedding, and thatching materials, as well as fruits, religious products, and cash products are all obtained from trees. However, it is probably the fodder obtained from trees that is the most important product. For at least part of the year (in some communities throughout the year) the major component of livestock feeds (for buffaloes, cows, goats, and rabbits) is tree fodder. Over 100 species of trees are used for fodder in the Nepalese hills.

Livestock numbers in the hills are declining due to a reduction in fodder resources and an increase in the proportion of children (herders) going to school. This has implications for soil fertility, because it is principally dependent on manure for the maintenance of nutrient status and soil structure.

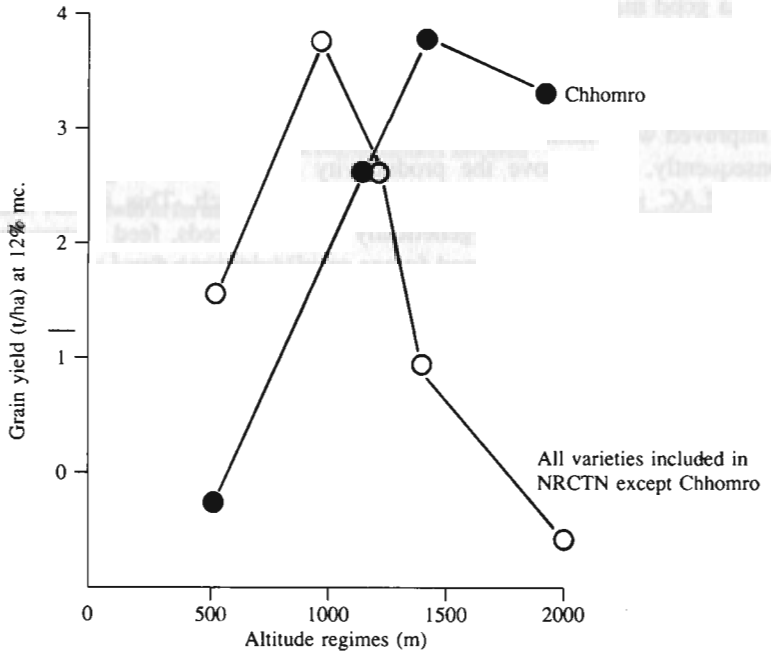


**Figure 30.10: Comparative yield performance of chhomrong (●) and mean yields of all other varieties in the national rice cold tolerance (○) across wide altitude regimes, 1987–1988**
*Source*: Sthapit, B.R. Proposal for Release of *Chhomrong* Dhan, LAC, Working Paper 11, 1990

This situation required a radical solution, and has been tackled by LAC and the farmers from its extension command area through the following interrelated programmes.

- Increase in stall-feeding of livestock to reduce grazing pressure on present fodder resources and allow natural regeneration and the establishment of new plantations.
- Identification of suitable fodder species and nursery raising/establishment/management methods through research and observation of farmers' practices.
- Provision of fodder tree saplings through the establishment of LAC-run and privately run nurseries.
- Organization by villages (with the assistance of LAC field staff) of forest user groups and livestock development committees.
- Training of extension field staff (livestock and forestry), nursery staff, and farmers, and visits by farmers and staff to other areas of the country.
- Initiation of special Fodder Saturation Programmes, in those areas with acute need and cattle/buffalo production potential.

These programmes are allowing the transition from a grazing-based to a stall-fed system of livestock raising, with concurrent increase in the fodder resource and a gradual improvement in the environment. During 1988/89 some 350,000 saplings were distributed (approximately 20 per household in the LAC extension command area). Plantations were mainly on private land around the home or on unused, marginal, or degraded land (Shrestha 1989).

Thus, plantations are cared for either by private individuals or by the community. Survival rates are comparatively high at 42 per cent after three years (Balogun and Harrison 1989).

Thus, the effort is a combined one of research, extension, and training. It is a multidisciplinary effort depending upon research by the Forestry and Livestock sections and implementation by forestry and livestock extension staff. It is a long-term programme which is only showing real benefits now after about ten years of sustained effort. The programme is a response to a real need of farmers, and it affects all the major components of their farming system. Its success depends upon using indigenous technical knowledge, as the majority of the fodder species raised in the nurseries are those requested by farmers.

The sustainability of the programme is ensured by the establishment of private nurseries with trained staff who will be able to continue raising seedlings in the absence of LAC. The forestry user-groups and livestock development committees (over 70 by July 1990) ensure that development is in the hands of those who stand to benefit.

## HIGHLIGHTS OF INNOVATIONS OF LAC

Lumle Agricultural Centre was founded in 1968. Since 1975 it has been an agricultural research, training, and extension centre for the western hills of Nepal.

The area is characterized by extreme diversity of agro-ecological and socioeconomic conditions. The smallholder farmers have limited resources, which are further threatened by continuing population increases. Farming is mixed, and the different components of the farming systems are interdependent. Markets are poorly developed and relatively inelastic.

LAC has evolved an institutional and technical *modus operandi* to minimize the diffi-

culties posed by its environment and to take best advantage of the opportunities presented. Through long-term, direct funding, LAC has been able to build up a stable, institutional structure capable of giving strong administrative support to its staff. Financial and managerial flexibility have enabled rapid response to hill farmers' problems. Integration into the national agricultural research network has further improved the cost effectiveness of the Centre through facilitating the uptake of new technologies and research methodologies developed at LAC by the national programmes.

The Lumle Model depends upon five major components: a strong institutional foundation, a comprehensive understanding of farmers' conditions, the participation of farmers in all stages of research and dissemination, the interdisciplinary interaction of all sections at LAC, and the synergistic effect of having research, extension, and training under one organization.

For each stage of the research process, LAC has developed or adopted techniques that are appropriate to hill conditions. Problem identification is often the subject for *Samuhik Bhramans* which facilitate a form of multidisciplinary, multi-institutional rapid rural appraisal carried out with a clear set of objectives and a disciplined working procedure. Through one such *Samuhik Bhraman* three major farmer-priority areas of work were identified for the development of agriculture in the western hills: (1) the maintenance and improvement of soil fertility; (2) the provision of fodder; and (3) the identification of income-generating activities. These three areas of work are incorporated into LAC's programme as cross-disciplinary Research Thrusts and support the more conventional single discipline research programmes.

Technology generation is carried out mainly on farmers' fields, and between 65 and 75 per cent of all trials and studies are being conducted on farmers' fields. There is a three-tier research network (on-centre, off-station research sites, and outreach research sites), allowing research to be carried out over a wide range of environments and maximizing farmer participation in the research process.

Technology identification is carried out on farmers' fields together with the extension services. For crops, the pre-production verification trial is the major tool used for verification of new varieties and practices.

The dissemination of technologies depends upon a multi-pronged approach: bi-monthly and six-monthly meetings with extension services, involvement of the extension services and farmers in the verification process, the use of published materials—particularly the *Prabidhi Sangalo* newsletter, the supply of high-quality foundation seed, and the training of extension staff and farmers. Further dissemination methods are being actively sought.

LAC is continuing to seek new extension methods appropriate to the hills and new research approaches that will lead to the development of relevant, sustainable technologies that will enhance the productivity and prosperity of Nepalese hill farmers.

## CONCLUSIONS AND RECOMMENDATIONS

The hills of Nepal offer a challenge to agricultural development agencies which is shared by many hill areas of the world. They are characterized by extreme diversity, environmental fragility, and complex smallholder farming systems.

The experiences of Lumle Agricultural Centre can be of use to others, but are unlikely

to be replicable in their entirety as situations will be different. With this proviso, the following recommendations are made.

For successful management of the project it is necessary to have:

- continuity of funding for a minimum of 10 years,
- direct funding,
- financial management responsibility,
- executive power,
- autonomy from government control,
- continuity of staffing, requiring a good working environment, and
- good administrative support to allow technical staff to operate.

For a successful programme, in terms of improvement in farmer productivity and income, the following are necessary:

- integration with national policies and programmes,
- understanding of farmers' conditions,
- involvement of farmers in all stages of research and extension,
- multidisciplinary research, to reflect the interdependance of the components of the farming systems,
- research, extension, and training all within the same institution,
- the development of working practices and methods of research and extension that are relevant to the conditions,
- a decentralized research process leading to location-specific recommendations,
- maintenance of a balance between technology generation and technology transfer, and
- sustainability of development through careful selection of technologies, monitoring of impact leading to modification where necessary, and the involvement of village groups in self-determination of development initiatives.

## ACKNOWLEDGEMENTS

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# 31

# MOUNTAIN AGRICULTURAL TECHNOLOGY DEVELOPMENT AND DIFFUSION: THE PAKHRIBAS MODEL, NEPAL

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## CONTENTS

## INTRODUCTION

Pakhribas Agricultural Centre (PAC) was established in 1972 as an agricultural training centre for British ex-Gurkha soldiers. Funding for the Centre comes from the British Government's Overseas Development Administration. The Centre is located centrally within the mid-hills of the Eastern Development Region, about 15 km northwest of Dhankuta Town.

In 1975, at the request of the Government of Nepal, the mandate of PAC was expanded to provide research, extension, and training services for the entire farming community within its target areas. Initially, the Centre's target areas covered two locations: the northern target area which covers eight panchayats of Tehrathum and Taplejung districts, and the local target area, which covers seven panchayats of Dhankuta District. The target areas represent highly heterogeneous environments and contain over 9,000 farm families.

Until 1982, the Centre's agricultural training and extension activities were confined to the northern and local target areas. However, over the years, the emphasis of PAC has expanded, and the Centre's activities are now divided among 10 technical sections: agronomy, forestry, livestock, horticulture, seed technology, socioeconomics, training, extension research, veterinary investigation, and analytical services and information supported by administration. Since 1983, the Centre has been providing technical support to the Koshi Hill Area Rural Development Programme (KHARDEP), another British-funded project. Through this association, PAC has become responsible for agricultural research and development activities in the four Koshi hill districts of Dhankuta, Tehrathum, Sankhuwasabha, and Bhojpur—an area of more than 7,000 sq. km with more than 100,000 farm families.

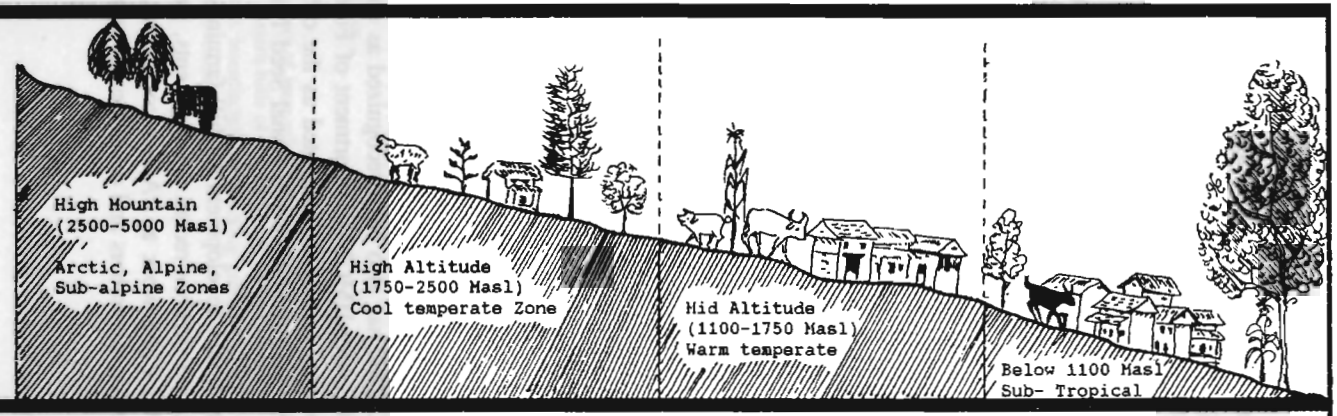
Following the establishment of the National Agricultural Research Services Centre (NARSC), which coordinates all crop and livestock research in Nepal, PAC has become an important part of the national agricultural research network. From July 1990, the Centre has had a mandate to cover the 11 hill districts in Eastern Nepal—an area of 21,267 sq. km with 252,436 farm families. PAC has also been recognized as one of the important hill centres for forestry research under HMGN's Department of Forestry and Plant Research. PAC's seed testing laboratory has been designated as the official seed testing centre for the eastern hill region by the government's National Seed Testing Programme.

This paper discusses an approach to research and development for hill farming systems, while highlighting the related problems, and reviews recent developments, particularly in light of the experiences of PAC. While the work at PAC is continuing, the review of experiences to date may be valuable for researchers and development workers elsewhere.

## AN OVERVIEW OF HILL FARMING SYSTEMS

The region contains diverse farming systems which are primarily subsistence patterns in nature. They change both within and across physical environments depending upon the resources available to the farmers and the needs of the family (Fig. 31.1).

In the High Himal (2500–5000 m), summer grazing of yak is practised on the tundra




| | | | | |
|---|---|---|---|---|
| Crops | No arable crop grown, upper limit of summer grazing. | Potato+Maize, Barley, Bari, Wheat, Radish, Beans. Mostly one or two mixed crops/year | Rice-Wheat, Maize-Rice, Maize/Millet Maize+ground nut, cabbage, peas. | Rice-Rice-Wheat, Maize/Ground nuts, Oilseeds, Tomato, Chilli, Brinzal etc. Mostly 2-3 Crops/year. |
| Livestock | Yak, Sheep, Goat Mainly Livestock enterprises | Goats, Pigs, Chicken, Cattle, Buffaloes, Rabbits | Goats, Pigs, Chicken, Cattle, Buffaloes, Rabbits. | Goats, Chicken, Cattle, Buffaloes, Pigs, Rabbites. |
| Forestry/ Vegetation/ Fruits. | Conifer trees, Shrubs | Pines, Utis, Gogun, Apple, Pear Plum, Peach, Walnut. | Pines, Utis, Nebharo, Katus, Chilaune, Khanyu, Plum, Peach, Pear. | Sal, Acacia Plants, Khanyu, Banana, Guava, Sub-tropical Fruits, Citrus |
| Problems | Snow, Access to grazing Pastures. | Erosion, Deforestation, Frost, Hail Stone, Over grazing. | Draught, Soil fertility, Erosion, Hail Stone. | Erosion, Fodder, Desease, Pest. |
| Opportunity | Pasture management Livestock Development (Marketing, Milk Procucts) | Vegetable Relay/Intercropping. Orchard Stablishment. Livestock Development Forest Plantation. | Forage/Legume intensificaion in rice-fallow pattern, Water Harvesting, Farmers training for management (Livestock, Forest, Crops) | Agroforestry in bari and red soil area. Water Harvesting. Farmer training for management. (Livestock, Forest, Crops) |

**Figure 31.1: Transect of inter-relationship between land use and altitude in the eastern hills of Nepal**

vegetation in open meadows. In these areas, sporadic and unreliable cropping may also occur.

In the high hills (1750–2500 m), the main staple crop is potato, frequently interplanted with maize. Barley and buckwheat are other important crops in this area. The climate is cool temperate, and there are *Quercus* forests.

In the mid-hills (1100–1750 m), a maize and finger millet cropping pattern predominates. Farmers keep a wide range of livestock, namely, cattle, pigs, buffaloes, and chickens. Rice-based cropping patterns are also practised in the mid-hills. However, rice-based cropping patterns predominate at low altitudes (< 1100 m).

In the low hills (< 1100 m), on *Khet* (irrigated lowland), the cropping intensity is very high with a rice-rice-wheat pattern which sometimes reaches 300 per cent. Many grain legumes such as beans, soybeans, cowpeas, and blackgram are interplanted with maize on the *Bari* (rainfed upland) and many of these legumes are also planted on the bunds of paddy terraces. Mustard is grown for its edible oil. Various vegetables, including cucumbers, pumpkins, aubergines, chilli, cauliflowers, cabbages, radishes, and broad-leaved mustard, are grown. Sub-tropical fruits such as citrus fruits, mangoes, bananas, guavas, and papayas are also found. Cash crops include cardamom, tobacco, and groundnuts. Ginger, garlic, and many other spices are also cultivated.

Livestock are an essential and integral part of farming systems. Cattle provide the main form of draft power, and manure is provided by all classes of livestock. The sale of animals and animal by-products is extremely important for small farmers; 55 per cent of the farm income is derived from livestock and small farmers actually earn more cash from this source than other middle and large-scale farmers (Conlin and Falk 1979). Crop by-products are used for animal feed. Recycling of the by-products is thus essential to maintain the integrated farming system.

Forests with a wide variety of vegetation occur in this region. In hill farming systems, the variety of trees and shrubs found on farmlands is of particular interest. These farmland trees and shrubs not only protect the soil from erosion but also provide the much needed fodder for animals, compost materials, timber and poles for construction, and firewood for household use. The intimate associations among the components of the system result in both positive and negative interactions (Fonzen and Oberholzer 1984). The direct interactions involve those among trees and field crops (soil conservation, shading of crops by trees), fodder trees and animals, and cattle manure and crops (Fig. 31.1).

Land holdings are very small and fragmented with 43 per cent of farm families having less than 0.5 ha of land. Moreover, small farmers usually have access to *Bari*, which is less productive than *Khet*. A single farm is rarely one contiguous piece of land, but four or five pieces scattered across more than one agro-ecological zone. This makes management difficult but also satisfies the diverse requirements of farming families and spreads risk.

## PROBLEMS OF HILL FARMING SYSTEMS

Most farmers in the area are often isolated both physically and in terms of their knowledge of the opportunities that contact with both governmental and non-governmental agencies might bring. Some of the problems of hill farming systems are briefly described below.

## Understanding Complex Farming Systems

In the hill farming system, farmers generally depend on a complex mix of crop, livestock, and forest products for their living. The farming system changes both within and across physical environments depending upon resources available to the farmers and the needs of their families. Stable crop production depends on livestock for manure and draft power, which, in turn, depend on crop residues, trees, and forest land for fodder.

Lack of understanding of complex farming systems, by the agencies involved in agricultural research and development, has been one of the most important drawbacks in generating suitable technologies for the hills. Most researchers and development workers have been brought up dealing with single disciplines. Therefore, an interdisciplinary farmer's complex farming system is not well perceived.

## Appropriate Technology

Like most developing countries, Nepal has established a National Crop Development Programme (NCDP) and Livestock and Forestry Research Centres which are centres for generating technologies by the use of formal research methodologies, e.g., breeding and selection. Many of the materials and technologies have been 'brought in' from international research centres. New technologies resulting from research processes are then tested and disseminated to farmers through extension services.

As almost all NCDPs and research centres have been located in the *Terai* and on resource-rich sites, most of the technologies that have been developed to date are not suitable for hill areas where the majority of resource-poor farmers reside. For example, after more than 25 years of research work on the major cereal crops, such as rice, wheat, and maize, the productivity increase of grain crops has been minimal (Annex 1).

As with agricultural research, much of the research work being carried out on livestock is based on the introduction of exotic breeds. There are numerous examples of failure of exotic goat, sheep, cattle, and buffalo breeds in the hills. The main reasons are poor nutrition, limited feed resources, and the inability of exotic breeds to withstand indigenous environments.

Evaluation of suitable fodder trees and grasses is also being initiated. Much research work has been implemented on exotic species such as Ipil-Ipil (*Leucaena* spp.), Eucalyptus, and pines, while emphasis on the evaluation of indigenous grasses and fodder trees is still lacking.

## Insufficient Emphasis on Use of Local Resources and Knowledge

At the farm level, especially in the remote hills, farmers have well-established systems of resource management and until recently have been able to provide most of the food requirements (Gibbon and Schultz 1988). With the increasing population, however, these systems are no longer self-sustaining and they now provide a declining proportion of food and other needs of the population. Seasonal off-farm portering or trading is now essential to restore deficits (Schroeder 1985). A further mechanism to adjust to this situation is semi-permanent or permanent out-migration. Nepal has a great wealth of local resources and traditional wisdom that needs to be fully exploited and understood.

Efforts, on the contrary, have been placed on the generation of technologies based on exotic and non-renewable materials. For example, the national strategies for crop research are based on the high input/output concept that came with exotic materials from the international research centres. New crop varieties are selected or bred using high levels of imported chemical fertilizers and pesticides. As Nepal is totally dependent upon imported agricultural chemicals, such technologies have been adopted by only a few resource-rich farmers in the *Terai* who have economic and political access, whereas the majority of the resource-poor hill farmers have not benefited (Chand et al. 1990). Due to uncertainty in the procurement and supply of imported chemicals, resource-rich farmers are also at risk. The present research system provides little emphasis on the comparison of local resources and knowledge in research strategies.

### Depletion of Forest Resources and Soil Degradation

Hill areas are vulnerable to landslides and soil erosion that result in the loss of cultivable or grazing land. Such hazards hit poorer groups more severely as they usually have access to limited areas of land. The slips and erosion may be partly due to the removal of forest cover for fodder, fuelwood, timber, and leaf-litter, as well as to the over-grazing of upland vegetation, and partly due to the feature of general instability in the fragile hill ecosystem. This is considered to be one of the many hazards faced by farmers in the hill areas.

There is much evidence of soil degradation due to very intensive cultivation and failure to add an adequate amount of soil nutrients. Sherchand et al. (1990) have reported that a significant amount of soil is being lost annually due to the farmers' traditional method of maize cultivation.

One of the reasons for the farmers' lack of interest in the sustained management of forest resources in the past is said to have been the government's legislation; this has not been very sympathetic towards the farmers, particularly in relation to the use of forest resources. Although the legislation is now more sensitive to farmers' needs, there is a legacy of mistrust of the forestry staff and a lack of knowledge among the forestry staff that perpetuates this attitude (Gronow 1987).

## PAC'S APPROACH TO ADDRESSING SOME OF THE PROBLEMS OF HILL FARMING SYSTEMS

### Interdisciplinary Approach

PAC now believes that individual disciplinary research cannot successfully gain a holistic understanding of farmers' problems. Considering the subsistence or semi-subsistence nature of complex hill farming systems described above, development decisions are more complex than those encountered in the *Terai* systems, which more closely resemble commercial farming.

From the beginning, and with the establishment of various disciplinary sections at PAC, the Centre developed a farming systems approach to agricultural research and extension. Several sections developed techniques and approaches that indicate a sensitivity to the needs and environment of farmers, farmers' knowledge, and the need for multidis-

ciplinary interaction in the identification and planning of research processes. As a result, programmes also underwent significant modification over time (Chand 1987, Khadka and Gibbon 1988, Thapa 1985).

The sections developed multidisciplinary work at different rates, depending upon the strength of individuals and available manpower support. However, there was inevitably a tendency to develop programmes in isolation from each other and to focus on those parts of farming systems that were perceived to be of high priority by individual disciplines. Although many important linkages were identified, and resulted in adjustments to programmes and recommendations, there was no mechanism for broadening a programme to examine these linkages in greater depth.

In order to address this rigidity in research programmes and to deal with complex farming systems in greater depth, in 1988 PAC developed a number of interdisciplinary working groups (Fig. 31.2).

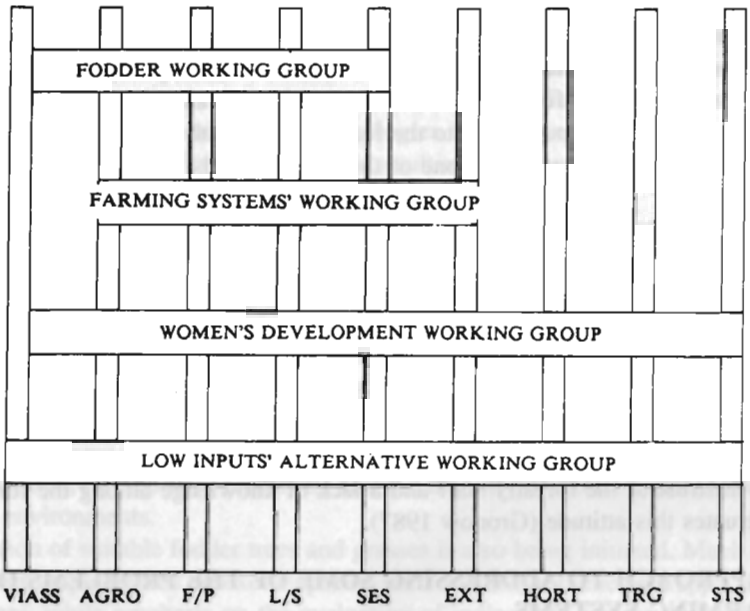



**Figure 31.2: PAC's interdisciplinary working groups**

Key: VIASS: Veterinary Investigation and Analytical Services Section; AGRO: Agronomy; F/P: Forestry and Pasture; L/S: Livestock; SES: Socioeconomic; EXT: Extension; HORT: Horticulture; TRG: Training; STS: Seed Technology Section.

*Source*: Pakhribas Agricultural Centre.

## Interdisciplinary Working Groups

A working group is an interdisciplinary group of agricultural scientists, livestock experts, socioeconomists, and foresters. It tackles interdisciplinary research problems identified in the field through coordinated programmes. Each group has one coordinator and seven to eight core members representing the various disciplines concerned. There are currently

four working groups at PAC dealing with major interdisciplinary problem areas. Their rationale, approach, and implications are outlined below.

*Working Group on Low Inputs Alternative Technology*

The work of this group evolved from an examination of the implications of high external input technologies that are recommended for farmers in the hills of Nepal. The group collects information regarding the knowledge of traditional farmers on the use of indigenous resources. It also conducts research on various methods of livestock and crop protection that rely on local materials, as well as research on the further development of composting and manuring technology and systems of resource management that concentrate on enhancing long-term stability rather than short-term production payoffs.

*Working Group on Women*

In common with other research systems, it took PAC many years to recognize the important role that women have in hill farming systems in Nepal. However, this group has been set up also because of the fact that a significant number of household heads are women (Thapa 1989). This group aims to collect detailed information about the involvement of women farmers in different aspects of farming, e.g., fodder and fuelwood collection, crop cultivation, livestock rearing, and decision-making processes. It is quite probable that this activity will have a useful linkage to the experience of community forestry development programmes and other works with groups who have common interests, and a linkage to recognized nutrition, food sufficiency, and cropping strategies (Cassels et al. 1987). The setting up of this group has highlighted the fact that the Centre has far too few female staff to work confidently in this field, considering the problems related to the further development of this work.

*Working Group on Fodder*

Livestock are an important link between the agricultural and forestry systems of hill farming. The organic manuring of fields, associated with animal husbandry, is an essential aspect of subsistence agriculture. In order to sustain this system, fodder supply, particularly at critical periods of the dry season, is most important. The group, therefore, provides a forum for coordinating work that until recently has taken place in three sections—agronomy, forestry, and livestock. It has a mandate to examine the important interactions in the flow of fodder and nutrients through the system. The work is focussed on the provision of fodder quality and quantity throughout the season and examines the implications of evidence for a decline in fodder availability and investigates potential for improvements.

*Working Group on Farming Systems*

The main objectives of this group are to collect and analyse information from secondary and primary sources on resource distribution and use in the hills, to characterize the major farming systems, to quantify labour and distinguish gender issues in labour use, to understand changes in the systems and how intra- and inter-household decisions are made, and to provide the understanding of farming systems by all PAC staff including HMGN staff in the eastern hills. The work of this group relies on the participation of

all scientific and extension staff and the cooperation and support of farmer client groups. The approach is aimed at generating a more complete, dynamic picture of farming systems so as to provide more relevant information for future research programmes. The group encourages innovative approaches to the development of alternative technologies that could make much greater use of social science inputs and farmer knowledge in the planning, implementation, and evaluation of research programmes.

### Samuhik Bhraman

Another interdisciplinary approach that has been found most effective for understanding farmers' needs and prioritizing research programmes is *Samuhik Bhraman*. *Samuhik Bhraman* (the Nepali name means 'group trek by a multidisciplinary team') is a method of initiating, prioritizing, and replanning research that has been developed in response to the particular environment of the hills of Nepal (Chand and Gibbon 1989). It is also considered to be an appropriate, rapid, informal interdisciplinary procedure that can be used to understand the farmers' environment (e.g., farmers' traditional knowledge, resources, and development capacity). *Samuhik Bhraman* enables multidisciplinary groups to interact with farmers in their own fields in order to better understand their problems and priorities. Details on the methodology of the *Samuhik Bhraman* and its role in eliciting farmers' interests and skills can be found in Chand et al. (1990).

### Farmer-oriented Research Approach

PAC has been designated as one of the agricultural research and resource centres in the Eastern Region of Nepal. It conducts both on-station and on-farm research in crops, horticulture, forestry, and livestock. Most of the on-station research is coordinated with various NCDPs, horticultural centres, forestry research divisions, and livestock farms. PAC also designs and conducts its own on-station trials to meet its regional needs. Promising technologies are further tested in farm trials which are also a source of ideas for future research. On-station research at the Centre also takes due interest in farmers. For example, the agronomy section of PAC has been involving male and female farmers for the evaluation of crop breeding and varietal selection. The on-farm research of PAC emphasizes the fulfillment of the needs of farmers in the hills. The overall objective of the on-farm research programme is to produce recommendations for improved technologies which are of relevance to the majority of farmers in the hills. Detailed steps, adopted by PAC for conducting farmer-oriented research, are described below.

### Site Selection

To implement on-farm, farmer-oriented research, the Centre initially worked together with the KHARDEP project to select representative sites, within the new research command area, using the cropping systems programme methodology. In 1983, three agricultural service centres were selected in each of the four Koshi Hill Districts. Each centre has a command area of four to seven *panchayats*, and in each area one representative *panchayat* was selected for on-farm farmer-oriented research (Fig. 31.3). Those representative *panchayats* were then subjected to site description surveys, using secondary data and key

informant farmers' surveys to provide background information on available resources, infrastructural development, institutional involvement, existing common cropping patterns, and livestock practices.

In 1985, PAC adopted the concept of recommendation domains, and this helped to further define and establish research priorities at the on-farm, farmer-oriented research sites, e.g., some domains are more important than others (Kayastha et al. 1989). On-farm research trials are now designed for the three agro-ecological zones (high, middle, and low altitudes) and three land types (rain-fed upland, irrigated lowland, and rain-fed lowland). As each on-farm, farmer-oriented research site consists of a number of different recommendation domains, research staff have focussed on producing recommendations for the farmers within those particular domains.

As more information and experience is gathered from on-farm research sites, the recommendation domains are being constantly re-evaluated and refined. Once the sites were selected on the basis mentioned above, PAC followed certain procedures for setting research priorities. As the research needs identified by the KHARDEP survey could not be accommodated at one time, PAC started to prioritize the research needs of farmers based on wider information than the site description survey described above. The following procedures were followed for setting research priorities.

## Setting Research Priorities

*Land-use Mapping Data*

These are derived from air photo interpretation and ground surveys, leading to the allocation of broad priorities to cultivated areas of particular crops and cropping patterns as well as the forest distribution type within a particular area. Annex 2 shows that 78 per cent of all land in the eastern hills grows at least one maize crop per year, compared to 33 per cent of the land which grows at least one rice crop per year. Of the rain-fed *Bari*, the most important cropping pattern is the maize/finger millet system (67% of all *Bari*). Therefore, the research priority is geared to the maize and maize/millet cropping system.

*Feedback from the District-based Staff*

The district-based staff of PAC, who normally spend 50 per cent of their time in the field, have been able to fine-tune the data from site description surveys. For example, field agronomists were able to clarify that among the reasons for farmers' adoption of cropping patterns, factors such as irrigation reliability, grazing problems, labour shortages, and availability of fertilizer were important. Similarly, livestock staff were able to identify the problems of fodder shortages, farmers' preferences, and prevalence of animal diseases.

*Samuhik Bhraman*

PAC believes that researchers cannot successfully gain and understand the farmers' perspectives until and unless they develop ways of learning from farmers and colleagues in the field. *Samuhik Bhraman*, as described above, is one of the strong methods of prioritizing research activities.

*On-farm Research Methodology*

PAC conducts various on-farm trials on livestock, e.g., animal breed comparison

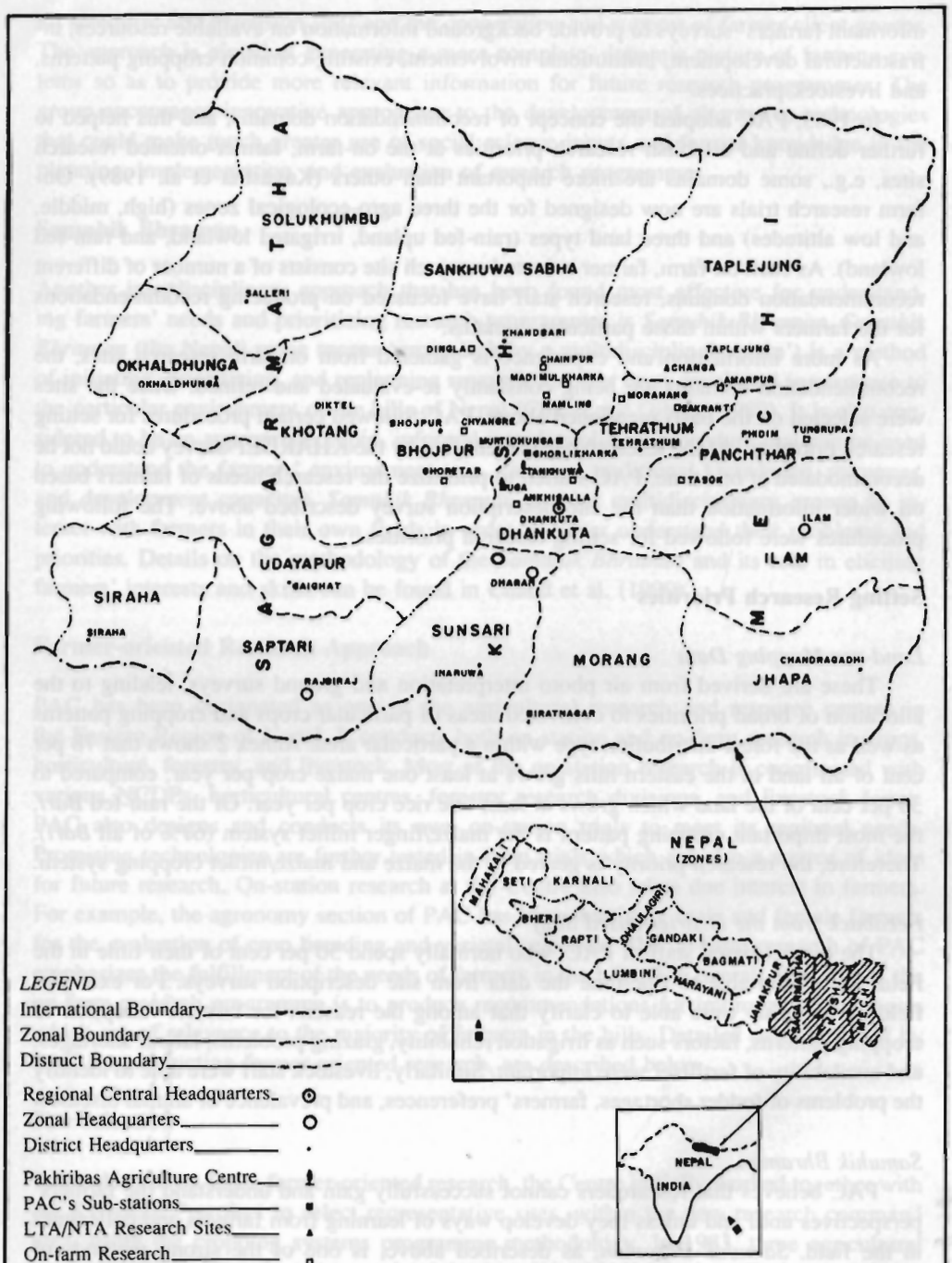



**Figure 31.3: PAC's research sites**

*Source*: Pakhribas Agricultural Centre

study and forage evaluation study. Similarly, the Forestry Section does various silvicultural and management studies in the farmers' fields. Crops are tested on small plots in farmers' field trials, in the beginning, and then better technologies are verified on larger plots, in pre-production verification trials. Most of the trials carried out on livestock, forestry, and crops are farmer-managed with guidance from the respective scientists. Details of on-farm methodology can be found in Oli (1987) and Chand (1987).

## Group Approach

Over the years, based on its own experience, PAC has learned that there are some innovations that are adopted and disseminated quickly if the community or groups of farmers are made integral partners in the research and development process. Women farmers in kitchen garden programmes, the community approach to intensify rice-fallow systems, and the involvement of farmers' groups in community and private forestry programmes are some of the approaches instigated by PAC.

*Women Farmers Group*

In 1986, PAC initiated a women's development programme, initially on a limited scale, with local women farmers. Later on, as the programme expanded, home-based women motivators were recruited to run the programme. The women motivators assist in organizing women's groups and in conducting training. So far, women's groups have been formed in three *panchayats* of the local target areas. The committees are formed at the ward level where members are selected representing 7 to 10 neighbouring households. Among these members, one is chosen to represent the ward on the main *panchayat*-level committee. Officials for the *panchayat*-level committee, such as chairperson, vice-chairperson, secretary, and treasurer, are chosen from among the ward representatives. PAC does not intervene in the process, but leaves it entirely to the women farmers.

PAC has an indirect role in the committee of assisting in developing linkages with other offices or institutions within the districts. At the request of the committee, PAC provides the necessary inputs and expertise for training. However, training needs and other logistics are identified and managed by the group. The committee meets every month to discuss their problems and future programmes. The kitchen garden programme, which was implemented in seven *panchayats* of Dhankuta District, was the first thrust. Gradually, other skills such as fruit and vegetable preservation, seed selection and storage, small livestock keeping, and fodder planting were introduced. Women's participation in the programme has increased dramatically since the inception of the programme. More details can be found in Thapa et al. (1990).

*Community Approach for Crop Intensification*

The rice-fallow cropping system is one of the important cropping patterns in the eastern hills. About 10 per cent of the total cultivated rain-fed lowland comes under this pattern. Usually, after the rice crop the field is left fallow because of lack of sufficient moisture to grow a subsequent crop. It has been found that even some of the drought-tolerant crops, legumes, and forage crops cannot be grown successfully due to grazing pressure. The Agronomy and Livestock Sections have demonstrated that drought-tolerant

legumes, such as chickpeas, and some of the forage crops, such as vetch, can be grown successfully with the involvement of a group of farmers. Grazing is avoided as the farmers involved feel responsible for saving the crop. In this way, farmers can obtain an extra crop and quality forage out of their fallow land after the rice harvest.

*Approach for Group Involvement in Community and Private Forestry*

The Forestry Section of PAC has successfully demonstrated that farmers' groups can be mobilized effectively for the establishment, protection, and management of community and private forests. The procedures followed for such an approach are: studying in detail the physical and social environment of the area; identifying local interest groups; understanding their needs and opportunities; and involving them right from the programme formulation stage, where decisions are taken by the farmers themselves. The innovative approach adopted by the Centre in planning, designing, and implementing community and private forestry programmes through community self-help groups (user groups) is considered to be one of its most successful programmes (more details can be found in Thapa et al. 1990). PAC has demonstrated that, given suitable encouragement and guidance, possibilities exist for the most successful protection and management of forests over large areas of Nepal through local cooperation. Forests in the hills now attract attention through approaches that involve the village people and communities and there is a growing optimism about eventual results.

**Linkages with Different National and International Institutions**

Although PAC is autonomous in its organization and management, it is technically integrated within the national government research network of agricultural and livestock farms and stations under NARSC and is recognized as a regional research centre by the NCDPs and the Forestry Research Division, Department of Forestry and Plant Research. PAC's location in the mid-hills and its sub-centres at high and low altitudes offer excellent hill testing sites for agronomical and horticultural crop varieties and husbandry trials organized by NCDPs and central-level horticultural farms. An excellent example of this cooperation with national programmes is the release of a new white maize variety, Manakamana-1, which was jointly developed by the research staff at PAC and the National Maize Development Programme. Similar work is in progress for wheat and rice.

PAC's technical section has established a close link with the district-based line agencies such as the Agricultural Development Office (ADO), the District Livestock Development Office (DLDO), and the District Forest Office (DFO). PAC'S Livestock Officers and Agronomists are posted in each of the Koshi Hill Districts. These technical staff assist ADOs and DLDOs on technical matters such as reporting and providing advice on the latest information on livestock and crop development and providing training support to their staff. The Forestry Section of PAC has already started a joint programme with the DFO on community and private forests. Similarly, the Horticultural Section of PAC has started a pilot vegetable production project jointly with the ADO near the district headquarters. The Livestock Section of PAC has taken the responsibility of supplying quality inputs to support the DLDO's programme. From 1985, the Agronomy Section,

with the consent of the NCDPs, has taken the responsibility for the timely supply of well-proven crop minikit sets to meet the ADO's targets in the four Koshi Hill Districts.

PAC has a strong link with the National Farming Systems Research and Development Division Programme. It actively participates in the FSR working group meetings, and both the institutions send their staff to the *Samuhik Bhraman* organized by both institutions. PAC also maintains strong links with the work at the Lumle Agricultural Centre through exchange of information and frequent staff visits. PAC's on-farm research team has cooperated with the Mechi Programme (Netherlands Development Organization—Nepal). The Centre has been helping the Mechi Programme by supplying trial sets and minikits, and organizing field staff training (Chand et al. 1987). In turn, PAC is receiving feedback on crop performance. PAC also provides crop extension support to other institutions, both in the area and outside, such as Uttarpani Technical School, Small Farmers' Development Programme, British Welfare Centre, and Action-AID Nepal.

PAC has established good links for the exchange of research materials with international research centres such as International Rice Research Institute, International Wheat and Maize Improvement Centre, International Institute for Tropical Agriculture (Nigeria), International Potato Centre, Centre International de Agricultura Tropical (Colombia), and International Crop Research Institute for Semi-Arid Tropics through concerned NCDPs. The Centre has also established a working relationship with Centre for Tropical Veterinary Medicine (University of Edingburgh), Overseas Development Group (University of East Anglia), and Oxford Forestry Institute (University of Oxford).

## HIGHLIGHTS OF SOME ACHIEVEMENTS

PAC, through its multidisciplinary farmer-oriented research activities, has been able to achieve considerable success in the resource management and diffusion of technologies to the farmers and has also been successful in bringing about changes in the attitude of the majority of farmers towards improved and sustainable farming.

### Indigenous Resource Use and Management

One of the aims of PAC has been to encourage and promote the use of local resources for sustainable farming. The working groups of PAC started numerous research activities that emphasize the identification and use of local plant materials for soil nutrients and the control of crop and livestock diseases.

To find viable alternatives to the use of external inputs, PAC has conducted many on-station and on-farm research trials to examine the effect of locally available green manure on crop yield. It has also conducted studies on the possibilities of extending and, in some cases, re-establishing some of the traditional green manure materials. This has been particularly true in areas where heavy promotion and use of chemicals has resulted in a 'loss of knowledge' regarding local materials traditionally used as green manure (Chand et al. 1990). Preliminary research shows that the use of local green manuring plants has beneficial effect on rice yield. Some local green manures, such as *Adhatoda vesica, Albizzia lebbek, Hularrhwa antidysentrica,* and *Jatropa curcas*, produced 23, 17, 14, and 11 per cent more yield over the control (no green manure) and in some cases produced higher yields than the application of 60:30:0 NPK/ha (Sherchand et al. 1990).

Similarly, studies on the effect of Azolla on rice yield showed interesting results. The highest rice yield (4.5 t/ha) was obtained from 30 kg N/ha with Azolla incorporated (20 t/ha) as a basic application, and this gave 31 per cent increase over control.

Results from trials conducted at PAC to test different locally available plant materials to control *Sitophilus orazai* in wheat, indicated that local plant materials such as *Azadirachta indica* and *Zanthoxylum alatum* are as effective as 5 per cent Malathion dust.

Scientists at PAC have developed an oral drug from a wild shrub, locally called *Sihundi* (*Euphorbia royleana*). The drug has been found to be very effective in controlling *Ascaris summs* of pigs (Mahato and Rai 1988). Details on farmers' traditional knowledge of plant and animal disease control can be found in Chand et al. (1990).

**Adoption of Technologies**

PAC believes that any improved technology given to the farmers should perform well under their management. This is why PAC modifies the conventional research design into a form that accommodates farmers' practices or management. For example, the pre-production verification trial which was introduced by the cropping system programme, was designed originally to test new improved varieties to be used as a package with local varieties. PAC modified this into a 'diamond trial design' that splits improved packages into two components. The pre-production verification trial can now provide information on local versus improved packages, local versus improved varieties, local versus improved husbandry practices, and the effect of the interaction between variety and husbandry.

PAC has so far recommended 13 wheat, 11 maize, 12 rice, 3 potato, 5 barley, 2 millet, and about 17 different winter and summer legume crops for general production. Thapa (1985) reported that about 99 per cent of the farmers in the local target area cultivate improved wheat and more than 60 per cent grow improved maize. Over the last 15 years, PAC has been producing seeds of many crops and vegetables in its local and northern target areas. After the inception of the PAC/Koshi Hills Agricultural Programme seed programme in 1988, it started multiplying seeds of many improved cereal, legume, and vegetable crops with the involvement of private growers and local cooperatives in four Koshi Hill Districts (Annex 3).

While recommending any crop varieties and livestock breeds, PAC takes into greater consideration the socioeconomic conditions of farmers. For example, coarse, low-quality rice varieties (which give a feeling of fullness in the stomach) are mainly liked by resource-poor farmers who often have to do hard labour. On the other hand, resource-rich farmers prefer soft and long grain rice. PAC takes into account these factors while recommending any crop variety and also considers the importance of crop by-products for animal feed. Almost all rice varieties recommended by PAC produce higher or equal straw yields than the local varieties (PAC 1988). Seed rates of maize in on-farm maize trials are increased by 50 per cent over the national recommendation, since farmers use thinned plants to feed their animals and a higher plant population in the beginning provides insurance against poor germination and disease pest damage.

Due to the failure of most of the improved breeds of livestock, PAC started research work on the evaluation of cross-bred and indigenous animals. The PAC pig, a cross

between an improved breed and the local black pig, produces 32 per cent more meat in a year than the local breed. Similarly, cross-bred poultry produce significantly more eggs and meat than the local breed under a semi-intensive system. After evaluating promising breeds of native and exotic goats, PAC came to the conclusion that the indigenous goats are best; they produce more meat than the exotic goats and are more tolerant to many diseases and stresses.

**Development and Promotion of Community and Private Forestry**

In Nepal, PAC is one of the organizations that has approached private tree planting in a structured manner. The approach chosen by the Centre to promote this programme involves more than just the distribution of seedlings. It includes raising trees and crops together, planting fodder and fuelwood blocks on land that would otherwise be unproductive, and the continuous monitoring of the programme. Over the years, more than 1,000,000 seedlings of fodder, fuelwood, and timber species have been distributed for private planting, and survival rates as high as 60 per cent have been achieved. As a result, more than 1,000 fodder and fuelwood blocks have been established. Thirty-four farmers have already registered their private forests and more applications have been received by the District Forest Office.

Various species of fodder grasses and legumes have been screened, evaluated, and introduced in the villages for planting on terrace risers (which constitute about 25% of the total cultivated land area), intercropping in fodder and fuelwood blocks, and in community forests. Yields as high as 1,700 kg of dry matter per hectare per year of *Setaria anceps* have been achieved by the farmers. This has not only increased farmers' fodder resources but has also helped to stabilize terraces, reduce soil erosion, and restore land fertility.

Since 1983, PAC has been providing support to the District Forest Office for the initiation of community and private forestry programmes through the formation of user groups. Major focusses of the programme are development and promotion of appropriate methodologies for implementing community and private forestry, through the user group approach, in collaboration with concerned agencies, and the long-term study of these user groups, in terms of their participation in forest protection, management, benefit-sharing, and sustainability.

**Soil and Nutrient Loss Assessment**

It has been observed that excessive amounts of soil and nutrients are lost annually from cultivated land. PAC, for the first time, initiated a soil and nutrient loss assessment programme. The programme involves comparing different cultivation practices to find out the most appropriate method of crop cultivation.

Preliminary results of the study on maize cultivation showed that soil loss can be reduced significantly (at 17 t/ha) if maize is sole-cropped and sown on slopes with minimum tillage and mulch, in comparison to the normal practice (maize as the sole crop), which caused high soil loss at 36 t/ha. Similarly, nutrient losses, especially nitrogen and organic matter content, were found to be highest under the local cultivation method (Sherchand et al. 1990).

## CONCLUSIONS AND RECOMMENDATIONS

PAC, since its establishment as a Centre for providing agricultural training and extension support to a limited number of British ex-servicemen, has expanded over quite a large area, accommodating a larger number of farm families residing in the eastern hills of Nepal. Over the years, due to its continuous effort to improve the farming systems of hill farmers, PAC has been recognized by the Government of Nepal as an important hill research centre for the eastern hills. Its link with national and international research centres has enabled PAC to develop technologies that can be transferred to other areas. Lack of understanding of complex farming systems, by many research organizations, has led to the development of technologies that have not been fully adopted by the majority of hill farmers. PAC, through its multidisciplinary farmer-oriented research programmes, has been able to incorporate farmers' needs, resources, and knowledge in the research programme in order to develop long-term sustainable farming systems. PAC has also been able to employ a group approach in forestry, crop, and women's development programmes. In order to bring about more desirable changes in the hill farming systems, the following recommendations have been made.

- There is an urgent need to deal with the fertility and soil conservation issue. The first step for this would be to quantify actual fertility and soil erosion problems in the farmers' fields. For this, there is a need to conduct area surveys; understand farmers' interests, constraints and opportunities; and document the methods that farmers are traditionally following to minimize erosion and soil degradation problems.
- The conventional high input/output concepts presently employed in Nepal, based on external inputs, should only be concentrated in the *Terai* and other accessible areas and should not be employed in the hills where land holdings are small (average 0.5 ha) and most households live at subsistence level. Separate research programmes and strategies should be developed for the hills which take into consideration the local needs, tap traditional knowledge bases, and maximize the exploration and use of local resources for increased and sustainable food production.
- The success of any forestry programme in Nepal depends largely on effective farmer participation at all stages of programme implementation. Recently, much has been written on the importance of working with the farmers, but little has been written on how this can be achieved within the context of community and private forestry programmes in Nepal. PAC experience suggests that, if such schemes are to be successful, local groups with common interests must be clearly identified. Considerable time must be spent in the field with farmers exploring their needs and opportunities so that their requirements are met. Identifying such groups is a difficult task. However, experience has shown that there are existing resource user groups and other social groups which can provide an ideal point of entry into the local community. The way in which such groups are approached is of immense importance. To get the most out of farmers' participation requires a great deal of skill, and many of those who are involved in forestry development may not have such skills. New skills and field procedures will have to be developed to enable this type of scheme to succeed. This is an important area in which a greater concentration of inputs and resources is required.
- At present, there are many forest regulations that affect the use of trees on both gov-

ernment and private land. Many of the regulations are difficult to interpret due to frequent amendments. These regulations should be simplified and adequate information disseminated to the farmers in order to encourage community and private forestry on a wider scale.

- It is observed that technology developed or identified in one part of the Hindu-Kush area may be transferred successfully to another part where the environment is similar. There is evidence that some crop varieties developed in the northern hills of India can be grown successfully in the eastern hills of Nepal. Similarly, some livestock species brought from Himachal Pradesh, India, have adapted well to the eastern hills. International institutions such as ICIMOD can play a vital role in exchanging research materials for and organizing exchange visits with researchers.

There is a need for research scientists to build up a wider scope rather than being confined to and trained in single disciplines. This is an area in which ICIMOD can play an important role through organizing training for the researchers.

- It is recommended that ICIMOD establish formal links with hill agricultural research centres such as PAC and LAC in order to facilitate the further development of hill farming systems.

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# ANNEXURES

## ANNEX 1: Area, Production, and Productivity of Main Cereal Crops

**Table 31.1. Area production, and productivity of rice from 1968 to 1989**

| Fiscal year, year in BS | Year in AD | Area (000 ha) | Production (000 mt) | Productivity (kg/ha) |
|---|---|---|---|---|
| 2025/26 | 1968 | 1,162 | 2,178 | 1,874 |
| 2026/27 | 1969 | 1,173 | 2,241 | 1,910 |
| 2027/28 | 1970 | 1,183 | 2,304 | 1,945 |
| 2028/29 | 1971 | 1,201 | 2,344 | 1,952 |
| 2029/30 | 1972 | 1,140 | 2,010 | 1,763 |
| 2030/31 | 1973 | 1,227 | 2,416 | 1,969 |
| 2031/32 | 1974 | 1,240 | 2,452 | 1,978 |
| 2032/33 | 1975 | 1,256 | 2,605 | 2,074 |
| 2033/34 | 1976 | 1,262 | 2,386 | 1,891 |
| 2034/35 | 1977 | 1,264 | 2,283 | 1,806 |
| 2035/36 | 1978 | 1,263 | 2,339 | 1,853 |
| 2036/37 | 1979 | 1,254 | 2,060 | 1,642 |
| 2037/38 | 1980 | 1,276 | 2,464 | 1,932 |
| 2038/39 | 1981 | 1,297 | 2,560 | 1,975 |
| 2039/40 | 1982 | 1,265 | 1,833 | 1,449 |
| 2040/41 | 1983 | 1,334 | 2,757 | 2,066 |
| 2041/42 | 1984 | 1,377 | 2,709 | 1,968 |
| 2042/43 | 1985 | 1,391 | 2,805 | 2,016 |
| 2043/44 | 1986 | 1,333 | 2,372 | 1,779 |
| 2044/45 | 1987 | 1,423 | 2,982 | 2,096 |
| 2045/46 | 1988 | 1,423 | 3,200 | 2,250 |

*Source*: Department of Food, Agriculture and Marketing Service, HMG Nepal. Annual Report, 1987.

**Table 31.2. Area production, and productivity of wheat from 1968 to 1986**

| Fiscal year, year in BS | Year in AD | Area (000 ha) | Production (000 mt) | Productivity (kg/ha) |
|---|---|---|---|---|
| 2025/26 | 1968 | 208 | 233 | 1,119 |
| 2026/27 | 1969 | 226 | 265 | 1,173 |
| 2027/28 | 1970 | 228 | 193 | 846 |
| 2028/29 | 1971 | 239 | 223 | 933 |
| 2029/30 | 1972 | 259 | 312 | 1,204 |
| 2030/31 | 1973 | 274 | 308 | 1,126 |
| 2031/32 | 1974 | 291 | 331 | 1,137 |
| 2032/33 | 1975 | 329 | 387 | 1,178 |
| 2033/34 | 1976 | 348 | 362 | 1,039 |
| 2034/35 | 1977 | 366 | 411 | 1,123 |
| 2035/36 | 1978 | 356 | 415 | 1,166 |
| 2036/37 | 1979 | 367 | 440 | 1,199 |
| 2037/38 | 1980 | 392 | 477 | 1,218 |
| 2038/39 | 1981 | 400 | 526 | 1,315 |
| 2039/40 | 1982 | 484 | 656 | 1,358 |
| 2040/41 | 1983 | 471 | 634 | 1,343 |
| 2041/42 | 1984 | 451 | 535 | 1,181 |
| 2042/43 | 1985 | 483 | 598 | 1,239 |
| 2043/44 | 1986 | 535 | 701 | 1,310 |

*Source*: Department of Food, Agriculture and Marketing Service, HMG Nepal, Annual Report, 1987.

**Table 31.3. Area production, and productivity of maize from 1968 to 1986**

| Fiscal year, year in BS | Year in AD | Area (000 ha) | Production (000 mt) | Productivity (kg/ha) |
|---|---|---|---|---|
| 2025/26 | 1968 | 422 | 765 | 1,814 |
| 2026/27 | 1969 | 433 | 795 | 1,836 |
| 2027/28 | 1970 | 446 | 833 | 1,869 |
| 2028/29 | 1971 | 439 | 759 | 1,730 |
| 2029/30 | 1972 | 446 | 822 | 1,845 |
| 2030/31 | 1973 | 453 | 814 | 1,795 |
| 2031/32 | 1974 | 458 | 827 | 1,805 |
| 2032/33 | 1975 | 453 | 748 | 1,652 |
| 2033/34 | 1976 | 445 | 797 | 1,790 |
| 2034/35 | 1977 | 445 | 740 | 1,664 |
| 2035/36 | 1978 | 454 | 743 | 1,635 |
| 2036/37 | 1979 | 432 | 554 | 1,281 |
| 2037/38 | 1980 | 457 | 743 | 1,629 |
| 2038/39 | 1981 | 475 | 752 | 1,581 |
| 2039/40 | 1982 | 511 | 718 | 1,405 |
| 2040/41 | 1983 | 504 | 761 | 1,511 |
| 2041/42 | 1984 | 579 | 820 | 1,417 |
| 2042/43 | 1985 | 614 | 874 | 1,421 |
| 2043/44 | 1986 | 627 | 868 | 1,384 |

*Source*: Department of Food, Agriculture and Marketing Service, HMG Nepal, Annual Report, 1987.

## ANNEX 2

**Estimates of the Area (ha) of Net Cultivated Land under Different Cropping Patterns in the Eastern Hills**

| Cropping pattern | Zone | | | Total Eastern Hills | |
|---|---|---|---|---|---|
| | Sagarmatha Hills | Koshi Hills | Mechi Hills | ha | % of total |
| *Bari* | | | | | |
| maizefallow | 162 | 290 | 1,226 | 1,680 | 1% |
| potato + maize | 4,611 | 9,132 | 10,245 | 23,988 | 9% |
| maize + soya | 3,219 | 3,984 | 2,690 | 9,894 | 4% |
| maize-cereal | 4,619 | 1,753 | 4,932 | 11,304 | 4% |
| maize/millet ] | | | | | |
| maize-millet ] | 39,204 | 44,521 | 30,980 | 114,704 | 45% |
| maize-mustard | 802 | 3,046 | 1,555 | 5,403 | 2% |
| Total *Bari* | 53,014 | 65,631 | 51,700 | 170,346 | 67% |
| *Khet* | | | | | |
| rice-fallow | 2,128 | 16,983 | 5,677 | 24,788 | 10% |
| rice-wheat | 5,311 | 13,034 | 8,395 | 26,740 | 11% |
| maize-rice | 8,226 | 7,066 | 11,490 | 26,783 | 11% |
| rice-rice-fallow | 626 | 1,884 | 1,154 | 3,664 | 1% |
| rice-rice-wheat | 387 | 724 | 571 | 1,681 | 1% |
| maize-rice-wheat | 346 | 252 | 309 | 906 | 0.4% |
| Total *Khet* | 17,024 | 40,046 | 27,493 | 84,563 | 33% |
| Total *Bari* + *Khet* | 70,038 | 105,677 | 79,193 | 254,908 | 100% |

*Source*: Hildreth, *Land Resources Mapping Project Sciences Ltd. Summary Report of Kenting Earth* Ottawa, Canada: KES, 1986.

## ANNEX 3

**Targets and Achievements of the PAC/KHAP Assisted Seed Programme during the Fiscal Year 1988/89**

| Districts | Crops | Varieties | Total area (rop) | No.of farmers involved | Collection target(kg) (kg) | Collection achievement | Remarks |
|---|---|---|---|---|---|---|---|
| | Maize | *Manakamana*-1 | 33 | 9 | 600 | 361 | |
| | Wheat | RR-210 | 240 | 46 | 12,000 | 8,200 | |
| | Soyabean | Lumle-1 | 6 | 4 | 140 | 76 | |
| | Millet | Okhle-1 | 6 | 2 | 150 | 75 | |
| DHAN- | Rayo | KBL/MBL | 8 | 10 | 188 | 14 | |
| KUTA | Cress | Nepali | 18 | 21 | 450 | 122 | |
| | Peas | S/Local | 29 | 41 | 1,140 | 148 | |
| | F/Bean | K/Wonder | 7 | 10 | 290 | 22 | |
| | Broccoli | G/Sprouting | 2 | 4 | 60 | 27 | |
| | Radish | JWN | 30 | 23 | 900 | 296 | |
| | Maize | Manakamana-1 | 33 | 7 | 975 | 100 | AIC target |
| | Maize | H/Composite | 30 | 2 | 900 | 251 | is not |
| | Wheat | RR-21 | 80 | 19 | 4,000 | 3,737 | included. |
| BHOJ- | Soyabean | Lumle-1 | 3 | 1 | 75 | 51 | |
| PUR | Radish | Mino Early | 100 | 40 | 2,500 | 410 | |
| | Rayo | KBL | 21 | 20 | 300 | 75 | |
| | Peas | S/Local | 5 | 5 | 200 | 76 | |
| | F/Bean | K/Wonder | 2 | 2 | 100 | 16 | |
| | Maize | Manakamana-1 | 22 | 3 | 550 | 715 | |
| S/SABHA | | | | | | | |
| | Maize | Arun-1 | 8 | 1 | 200 | NA | |
| | Wheat | RR-21 | 320 | 48 | 16,000 | 14,100 | |
| | Peas | S/Local | 40 | 20 | 2,000 | 300 | |
| | Maize | Mana-kamana-1 | 9 | 3 | 450 | NA | |
| | Maize | H/Composite | 15 | 4 | 550 | NA | |
| | Wheat | RR-21 | 176 | 27 | 11,000 | 7,070 | AIC target |
| | Soyabean | Lumle-1 | 8 | 13 | 206 | 24 | is not |
| | Rice | P/Masino | 8 | 4 | 400 | 106 | included. |
| | Radish | Mino Early | 64 | 43 | 1,750 | 368 | |
| TEHRA- | Radish | White Neck | — | — | — | 64 | |
| THUM | Rayo | KBL | 16 | 18 | 485 | 323 | |
| | Rayo | MBL | 2 | 1 | 40 | 7 | |
| | Peas | S/Local | 6 | 9 | 300 | 32 | |
| | F/Bean | K/Wonder | 2 | 5 | 100 | 12 | |
| | Cress | Nepali | 12 | 12 | 300 | 86 | |
| | Broccoli | G/Sprouting | 1 | 1 | 50 | 57 | |

*Source*: Basnet 1990.

# 32

# AGRICULTURAL RESEARCH EXPERIENCES OF THE ARID ZONE RESEARCH INSTITUTE (AZRI) IN BALUCHISTAN, PAKISTAN

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## CONTENTS

## INTRODUCTION

This paper deals with problems specifically associated with, but not necessarily limited to, the operation of a research programme to aid agricultural management in mountainous and highland areas. These problems include the requirement for quantified primary information in the design of a successful research programme, the advantage of adopting a partnership arrangement in providing the necessary long-term continuity of a research programme, the need for timely reappraisal of strategic thinking after sufficient results become available, and the importance of ensuring that the impact of the research process, particularly in socioeconomic matters, is evaluated in a timely manner and takes the known climatic variability fully into account.

The problems associated with improved agricultural production in the arid and semi-arid mountainous areas (> 1000 m) of West Asia have received little or no effective attention from research workers in the past. In raising small ruminants, traditional farming systems have depended on either a nomadic or a transhumant mode with some sedentary subsistence agriculture based on winter wheat production. However, with the rapid increase in human population, experienced recently in West Asia, and in anticipation of the continuation of this trend into the foreseeable future, the governments of countries such as Pakistan have become oriented towards change. They are now relying upon increased and sustained agricultural production from less developed agricultural areas, such as the arid highlands, to help meet expected food production deficits in the future (GOP 1988).

## AGRICULTURAL RESEARCH PROBLEMS SPECIFIC TO DRY MOUNTAIN AREAS

The arid mountainous areas of West Asia share the common ecological characteristics of cold, heat, and drought, which pose a set of specific problems to the researchers' goal of increasing and sustaining agricultural output. At the core of these problems is the interaction between moisture supply and temperature. In order to grow crops with consistent success in such an environment, it is necessary to attune maximum crop development and moisture use with the brief period in which the influence of temperature constraints is minimized. Furthermore, research designed to monitor independently the direct effects of environmental variables, such as heat, cold, and aridity, will often result in a gross oversimplification of their influence. Rather, it is vital to consider the combined interactive process of the physical environment on crop growth.

One major environmental factor, which is characteristic of arid highland areas and has a substantial influence on both crop and animal productivity, is the extreme inter- and intra-year climatic variability which can be experienced (e.g., Figure 32.1). It may be difficult to design an agricultural system that can be functional in a dry but consistent environment, but it is much more demanding to design a flexible system for a predominantly dry environment that is also capable of responding to considerable variability in annual rainfall and its distribution, as well as the timing, duration, and intensity of frost, heat, and other climatic events. Unfortunately, arid highland areas generally have environments that fall into the latter category. If research programmes are to be effective in such areas, environmental uncertainty and risk factors have to be fully taken into account.

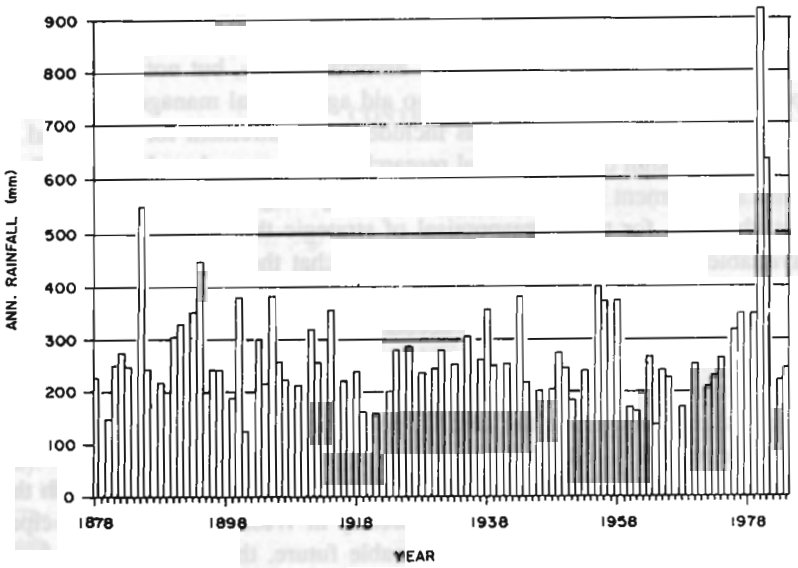


**Figure 32.1: Annual rainfall(mm) at Quetta in 1878–1986**

*Source* : Keatinge and Ress, 1988

## OPERATIONAL IMPLICATIONS: THE EXAMPLE OF HIGHLAND BALUCHISTAN

In order to operate an effective research programme in a particular dry mountainous area, it is necessary to appreciate that, although there may be climatic, social, and infrastructural problems that are common to many such areas, the actual research operation occurs in a very specific physical and human environment. AZRI's experience suggests that research programmes need to be initially focussed on specific problems with the expectation of generalizing at a later date, rather than dealing with general issues and hoping for specific local spin-off effects. Therefore, an intimate knowledge of the system for which the research is targeted is a primary requirement before research plans can be properly formulated.

In this paper we discuss the operation and impact issues arising from AZRI's research programme in highland Baluchistan. We seek to demonstrate that the research strategy adopted by AZRI is beginning to have appreciable results that may have a substantial impact by increasing productivity and reducing the annual uncertainty of agricultural output in the highlands. In addition, we hope to show that the applied research partnership adopted by ICARDA and AZRI may be useful examples which could be effectively copied in other areas.

## THE AGRICULTURE OF HIGHLAND BALUCHISTAN

In the arid highlands of the Baluchistan Province of Pakistan, the production of sheep and goats on approximately 20,000,000 ha of rangeland and subsistence production of

winter wheat on a further 125,000 ha of land are the predominant dryland agricultural activities. Irrigated fruit production is also important in economic terms but this is only carried out on a very limited area. Annual productivity of both crops and ruminants is very irregular and generally low, because of the harsh and agriculturally marginal climatic conditions.

Most of the people in the area are almost completely dependent on agriculture for their livelihood, and the population has approximately quadrupled in size in the last 40 years. This has led to a corresponding increase in the population of sheep and goats from around 1 million head in 1950 to more than 18 million head in 1986. These numbers are well above the economically efficient and ecologically sustainable carrying capacity of the rangelands (ICARDA 1990), and, thus, severe overgrazing, made worse by shrub gathering for fuel, has occurred in a widespread and sustained manner. As a result, the productivity of the now highly degraded rangeland vegetation is very low (Figure 32.2), and, in consequence, annual off-take from small ruminants is sub-optimal. Thus, the standard of living of dryland agricultural communities is inevitably low and, compared with the population of Pakistan as a whole, the farmers of highland Baluchistan are at a great disadvantage.

This deteriorating and distressing situation is probably common to other West Asian countries with similar ecological conditions, such as Iran and Afghanistan. However, ICARDA, in partnership with the Pakistan Agricultural Research Council's Arid Zone Research Institute, implemented a joint research programme in the highlands of Baluchistan in 1985 which seeks to address the problems of low and unsustained dryland agricultural productivity.

## DESIGN, CONTINUITY, DIRECTION, AND IMPACT OF AGRICULTURAL RESEARCH PROGRAMMES

### Design: The Need for Quantitative Primary Information

In the development of a research strategy for dryland agriculture, a shortage of reliable quantitative information is a major drawback in ensuring the effective investment of scarce human and financial research resources. Decisions regarding which research problems should receive priority are critical and often require extensive survey work before a realistic long-term strategic plan can be formulated (Keatinge et al. 1988).

For example, in highland Baluchistan, winter wheat is the principal dryland crop grown, while barley covers only 5 per cent of the cereal area. On the surface, this decision by farmers appears not to be very rational in economic and biological terms, as barley, traditionally a more efficient and reliable crop in areas of less than 300 mm annual rainfall, should be more consistently productive in the highlands of Baluchistan as the average annual rainfall there is closer to 200 mm (Kidd et al. 1988). Results from the AZRI agronomy trials over the last five years have supported the supposition that barley would be a more productive crop to grow than wheat.

Therefore, should AZRI be concentrating its resources on developing increased barley production? In light of the chronic and increasing deficit in animal feed in Baluchistan, the answer to this question is probably yes. However, AZRI's survey work with cereal farmers and ruminant herders has highlighted the complexity of this issue. Farmers have

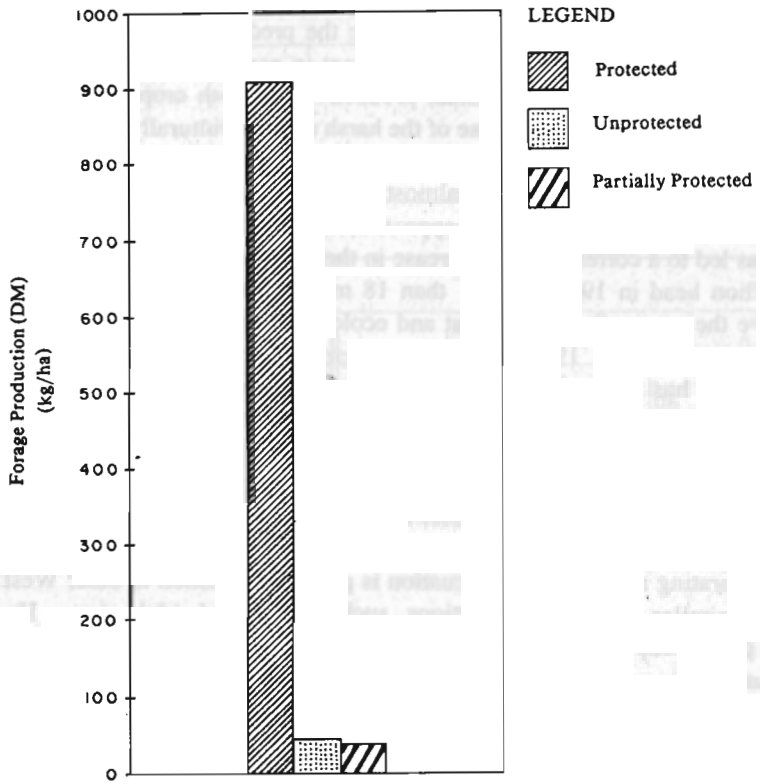


**Figure 32.2: Productivity of native range vegetation (kg/ha/yr) at Tomagh, Pakistan**

Note: protected treatments are means of six exclosures which have been ungrazed for three years. Partially protected treatments have been ungrazed for two six-month periods in the last three years under a rotational grazing scheme.
Unprotected treatments experience normal grazing pressures from local flocks.

*Source:* AZRI. 1990

indicated that, without a yield premium of at least 50 per cent, they would be unwilling to shift from wheat to barley production. Their reasons include a continuing desire for personal food security and the small and uncertain market for barley (Table 32.1). This, in turn, is linked to the need for farmers and herders to appreciate the value of small amounts of supplemental feeding, as demonstrated by AZRI, to improve considerably potential ruminant off-take (Table 32.1). Unless this occurs, the market demand for barley, which would be an ideal, locally produced source of animal feed supplement, cannot create a sufficient incentive to persuade farmers to change their traditional cropping pattern.

## Continuity: The Advantage of a Partnership Arrangement

Once a series of research experiments has been identified as having high priority for a research institute's programme, it is vital that they be continued for a sufficient time period to yield meaningful results. This time period is, of course, variable depending on the type of experiment; but it is safe to assume that in uncertain and marginal environments,

**Table 32.1. Ranking of reasons why farmers do not grow more barley in Highland Baluchistan[a]**

| Farmers' reasons for not growing more barley | Top Three Rankings[b] | | |
|---|---|---|---|
| | First reason | Second reason | Third reason |
| | % farmers responding | | |
| Grow wheat for food security | 97 | 3 | 0 |
| No secure barley market | 0 | 47 | 21 |
| Land shortage | 2 | 16 | 38 |
| Prefer wheat to barley straw | 0 | 13 | 9 |
| Wheat price higher than barley | 0 | 13 | 6 |
| Orchards are more profitable | 0 | 5 | 20 |
| Barley yields less than wheat | 1 | 2 | 2 |
| Labour shortage | 0 | 1 | 2 |
| Not profitable to feed barley | 0 | 0 | 2 |
| Total | 100% | 100% | 100% |

[a] Khuzdar, Kalat, Kachhi, Quetta, Pishin, Loralai, and Zhob Districts.

[b] Farmers were asked to choose and rank the three most important reasons as to why they do not grow more barley.

*Source*: Nagy et al. 1989.

**Table 32.2. Reproductive performance of Harnai ewes at Tomagh**

| | | |
|---|---|---|
| 1. | Date of breeding | September 15, 1987 |
| 2. | Number of ewes at breeding | 81 |
| 3. | Number of ewes at lambing | 81 |
| 4. | Number of ewes having lambed | 76 |
| 5. | Number of lambs aborted | 0 |
| 6. | Number of lambs born | 76 |
| 7. | Number of lambs dead (0–90 days) | 1 |
| 8. | Number of lambs weaned (90 days) | 75 |
| 9. | Fertility rate (4)+(5)/(3) | 94% |
| 10. | Prolificacy (6)/(4) | 100% |
| 11. | Weaning rate (8)/(6) | 99% |
| 12. | Number of lambs weaned per ewe put to breeding | 0.93 |
| 13. | Number of oestrous availed by the ewes to conceive One—75, Two—6, Three—0, Four—0 | |
| 14. | Services/conception | 1.14 |
| 15. | Average gestation period (days) | 155 |
| 16. | Sex ratio (male:female) | 1:1.2 |

*Source*: Atiq-ur-Rehman et al. 1989.

such as those of the arid highlands, more experimental years will be needed to ensure meaningful results than, for example, irrigated agricultural systems. A long-term breeding or selection programme, for example, with an expected duration of at least 5 to 10 years of very dry or extremely cold years in which crop failure is certain, can have a negative impact on progress. As these years of harsh environmental conditions are commonly experienced in the arid highlands, how are replacement seed reserves of selected material to be preserved to ensure continuity of the selection programme from every growth year? A disrupted research programme, in experience, is often either abandoned or in future

accorded much lower priority. This has important implications for the attainment of an institute's research strategy.

In AZRI's case, its research partnership with ICARDA helps to ensure vital programme continuity and to reduce research costs in Pakistan. For example, AZRI uses ICARDA's international nurseries, which are specifically targeted at highland areas, as the initial basis for its selection nurseries and yield trials for a range of crops. Evaluation of material selected in the first year of testing is then carried out at multiple locations over several years. Seed supply is always a critical determinant of the number of test locations which can be employed in any given year, particularly when lines are being promoted from single-rowed observation nurseries to multi-rowed replicated yield trials. If a very harsh year occurs, as in highland Baluchistan in 1987/88, crop failure at all locations ensues due to extreme drought. Should AZRI then lose all its experimental selected seeds, it would negate three years' progress in selection. However, one way in which ICARDA helps the AZRI programme is by acting as a seed supply reserve from its headquarters in Aleppo, Syria, so that more seeds from selected material are almost always available in experimental amounts for the purpose of programme continuity in the harsh seasons. The alternative of AZRI's duplicating each nursery under irrigation not only would be very expensive but also would not fully guard against the risk of crop loss if there was a sudden cold spell.

## Direction: How Results Should Influence Strategic Thinking

Once sufficient information is collected and a long-term strategy is devised in which research priorities are clearly defined, it is important to realize that change in the relative weighing of priorities can, and probably will, occur. This may well be in response to the perceived timing and size of the predicted impact of an intervention. This will obviously alter as the research process generates results and it becomes evident that one research approach is proving to be fruitful more immediately (or more certainly in the long run) than another.

For example, in 1986 AZRI initiated a series of rangeland management and rehabilitation trials at its sub-stations in Tomagh and Zarchi. These included large-scale management trials of native ranges, with and without complete or partial protection (deferred grazing), and small-scale rehabilitation areas in which new species of fodder bushes were introduced. As late as 1988, in AZRI's research plans, the grazing studies were accorded a higher priority than the range rehabilitation experiments (AZRI and MART/AZR 1988).

However, this situation was reversed by late 1989 as it transpired, from our experimental results, that the regrowth rate of native range vegetation was extremely slow even with full protection, deferred grazing as a management technique appeared to have little promise, and social grazing-protection techniques were less effective than had been previously contemplated (Figure 32.2). In direct contrast, range rehabilitation techniques, through the creation of small areas of fodder bushes (*Atriplex canescens*), indicated that the introduced species was well adapted to the environment and could be extremely productive up to 6 t/ha/yr of dry matter (Aro et al. 1988). Furthermore, in subsequent growth and digestibility trials with local sheep, the introduced fodder was found to be suitable for use as a winter supplement in maintaining body weight and to have potential for flushing ewes before mating (Atiq-ur-Rehman et al. 1990). In addition, social control of grazing

on these planted forage reserves near farmers' houses and other well-defined sites seems to be much more effective than simply making improvements on the general condition of the range.

Thus, the creation of fodder reserves as a range rehabilitation intervention seems likely to have a much greater potential impact and be more readily accepted than the potential interventions in range grazing management proposed in 1990. As a result, the AZRI's research programme in the planned period from 1990 to 1993 is now heavily biased in the direction of range rehabilitation, without necessarily cancelling the grazing management experiments. These have been reduced in scope, as well as in time requirement, in order to accommodate these trials by scientists (often the limiting factor at AZRI). In the setting of priorities and investment of resources, a judicious balance between long- and short-term experimental return must be maintained, but, within this balance, change can and should occur at appropriate intervals when the importance of additional research results has been digested. This need for a shifting order of priority should not, however, be regarded as a licence to make wholesale changes in an experimental programme on an annual basis. These changes should occur only when there is sufficient data to fully warrant amendment of strategic thinking, perhaps at two- to four-year intervals.

## Impact: The Need for Socioeconomic Determination over an Adequate Time Period

In ensuring that a research programme will have sufficient impact to maintain or, better still, increase research support levels for the arid highlands, care must be taken to evaluate the social and economic impact of an intervention over an adequate time period. We have already stressed the importance of inter-year climatic variability on the research process. This is also of considerable importance in the evaluation of farmer acceptability and impact in both social and economic terms.

For example, since 1986, AZRI has been testing improved catchment basin water harvesting systems for improved crop agronomic management (Figure 32.3). In the period between 1986 and 1989, both wet and dry years have occurred, and the economic benefit of taking some land out of production for water harvesting will obviously vary in the amount and distribution of grain in any one year. However, the crop year 1987/88 was very dry throughout most of Baluchistan and a large majority of farmers failed to get grain from their wheat fields. This will probably recur in two to four years out of ten, depending upon the specific location (Kidd et al. 1988).

In contrast, in AZRI experimental treatments of water harvesting techniques, some plots yielded enough grain (< 100 kg/ha) to return sufficient seed for farmers to plant in the following year as well as a good straw-yield for animal feed. Such experimental results in a very dry year will have a big impact on the collaborating farming community, as consistency of yield across the years is almost a more important parameter than extra yield in a favourable season, because domestic food security considerations for family and livestock are critical (Table 32.1). However, in strictly economic terms, averaging experimental results across the years may de-emphasize the results of a specific year such as 1987/88 and, as a result, underestimate potential research impact. The need, therefore, for continuous assessment of impact over a number of years and the inclusion of the known element of climatic variability are essential in the socioeconomic as well

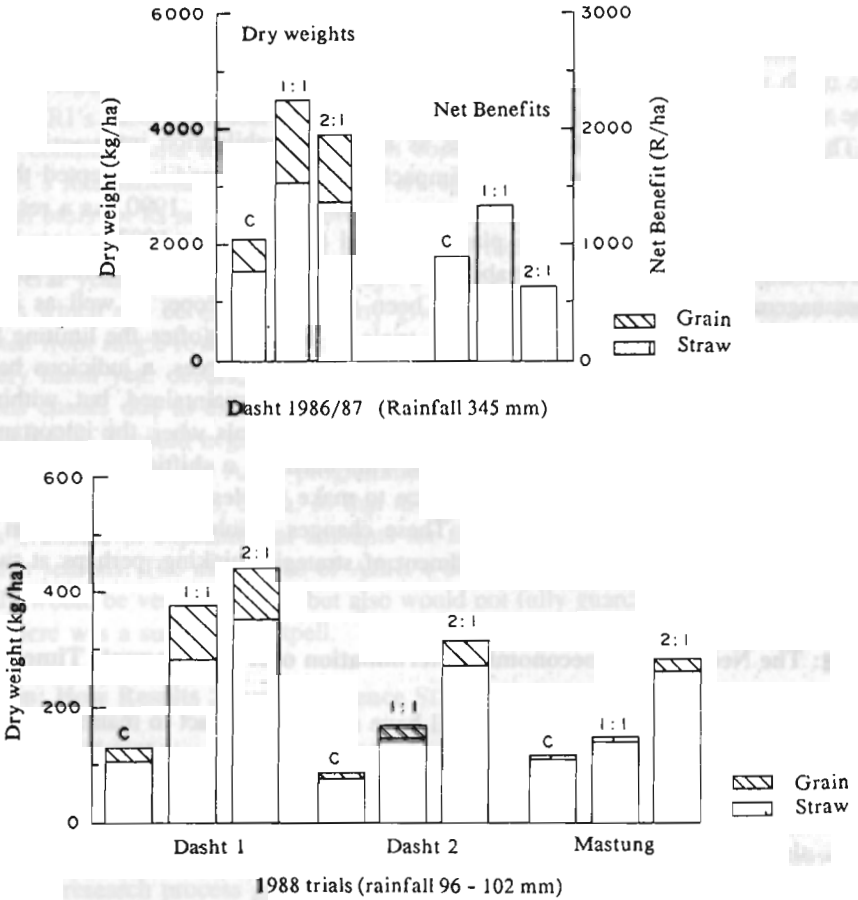


**Figure 32.3: Productivity and net benefits of water harvesting treatment with wheat at Dasht and Mastung, Pakistan, in the 1986/87, 1987/88 and 1987/88 crop growth seasons**

*Source:* Rees et al. 1989.

Note: 1US$ equalled approximately 18 Pakistani Rupees.
Treatments
1:1 = Half treated catchment:half cropped area
2:1 = 2/3 treated catchment:1/3 cropped area.

as the impact calculations, in order to avoid premature recommendations and injudicious investment in widespread adoption.

## CONCLUSIONS

We have attempted to demonstrate in this paper that, in the design, conduct, and impact of a research programme, for the dry, mountainous environment special consideration needs to be given. An attempt to transplant into the highlands a research programme, derived from experiences of a less harsh lowland environment, is likely to be ineffective. The problems of mountainous environments are both complex and highly specific. In consequence, agricultural research, although urgently in need of further investment, may be too daunting a task for national governments to fully accept the challenge of

providing the required level of human and financial resources. Initially, partnership arrangements between national and international agencies, such as ICARDA and ICIMOD, can be a fruitful way to demonstrate research impact on a small scale, in order to convince governments to adequately support the research required for the development of the disadvantaged agricultural communities in the arid highlands.

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# 33

# AGROFORESTRY AS AN OPTION FOR MOUNTAIN AGRICULTURAL DEVELOPMENT

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## CONTENTS

## INTRODUCTION

### Mountain Agriculture: Weakening Regeneration Processes

Despite increased public investment and interventions, mountain agriculture in most parts of the Hindu-Kush-Himalaya region is showing symptoms of decline. This decline is manifested by both stagnant or falling productivity levels and the diminished health of the production base. One of the basic reasons for the decline is the rapid erosion of the natural resource base of agriculture. In the past, mountain agriculture, broadly defined to include different land-based activities such as crop production, horticulture, forestry, and animal husbandry, was sustained largely through effective linkages among the above components. The latter helped in food and other biomass supplies, nutrient cycling, and regulation of moisture flows, essential for the stability of agriculture in mountain habitats. The organic integrity of mountain agriculture, based on the linkages and interactions of the above-mentioned components, has suffered due to increased population growth, market forces, and public interventions. The mechanisms (as well as immediate manifestations) of organic disintegration include reduced area under forests and other perennials, reduced diversity of agricultural production systems, and increased runoff as well as soil erosion. In various ways, these changes obstruct natural regenerative processes that are essential for the health and productivity of the natural resource base of mountain agriculture. The new agricultural technologies based on high yielding varieties (HYVS), in spite of their ability to raise crop productivity under favourable circumstances, offer no solution to the above problem. The resource-centred technologies do generate some hopes in this context (Jodha 1990c). Based on an understanding of the potential of resource-centred technologies to meet the twin goals of productivity and conservation, agroforestry is suggested as one means to contribute to the sustainable development of mountain agriculture.

### What is Agroforestry?

A technical practice that is commonly found in many traditional farming systems throughout the world, including mountain regions, is that of cultivating annual and perennial crops on the same landholding. This strategy, as an intentional manipulation of the land base to satisfy subsistence needs for food, fodder, fuelwood, and/or soil protection, is today called an agroforestry system. A definition of the term that is widely accepted is that of Lundgren (1982):

> . . . an approach to land use in which woody plants are deliberately combined on the same land management unit with herbaceous crops and/or annuals either in some form of spatial arrangement or in sequence. The concept of an agroforestry system implies both ecological and economic interaction among the components of the system.

Agroforestry encompasses a wide variety of land-use systems to realise increased productivity and more dependable economic returns while promoting the conservation of soil, plant, and water resources. A classification system proposed by Nair (1985) is based on four criteria: structure, function, agro-ecological setting and socioeconomic scale, and management levels of the system. From these factors, systems can be grouped as agrisilvicultural, silvopastoral, and agrisilvopastoral.

Shifting cultivation, home gardens, *taungya* afforestation, alley cropping, and wind

breaks and live fences are sometimes considered as additional categories of land-use systems (ICRAF 1983).

The agrisilvicultural system is defined by multi-storey, multipurpose cultivation of agricultural, horticultural, and tree crops on a single field. Intercropping (alley cropping), shelterbelts, production during fallow stages on shifting cultivation sites, shade trees planted on commercial plantations, and fruit or fuelwood trees grown on field boundaries are examples of this system.

When tree species are grown in combination with forage crops or pasture for livestock feed production, the system is termed 'silvopastoral'. Examples are animal production systems in which multipurpose woody perennials provide fodder (and fuelwood) or act as living fences around grazing or croplands. Trees retained for shade, fruit, timber, or fuelwood on pasture lands are also examples of this system.

Most commonly encountered in the HKH region, however, is the agrisilvopastoral system which combines elements of perennial and annual crops with animals or pasture. The crop/tree/livestock mix typically found around homesteads presents an example of this. The practice of grazing animals on fallow croplands, establishment and retention of fodder trees around fields, and use of woody shrubs and hedges for mulch, browse, and green manure point to the multipurpose uses of this diverse system.

## INDIGENOUS AGROFORESTRY

As a public intervention, agroforestry may be of recent origin, but, historically, the system has evolved over a much longer time. Planting of annual crops within forest areas (as under *taungya* cultivation) and rotating crops with forests (as under shifting cultivation) are two well-known examples of spatially and temporally focussed agroforestry systems. However, the most important form of agroforestry observed in mountain areas is the planting or retention of trees and shrubs with annual crops.

Two key factors that have contributed to the evolution of this last form of agroforestry system are: (1) the crucial role of biomass from perennials in farming systems and in the sustenance strategies of farmers, and (2) the changing patterns of availability and access to the tree products, following increasing pressure on lands producing perennials (e.g., common property lands).

Conditioned by these two factors, rural communities in mountain areas (and elsewhere too) have evolved different arrangements to ensure the availability of perennial plant-based biomass to complement their supplies from annual cropping to meet their production and consumption needs (Jodha 1988). These arrangements are ultimately reflected in the relative allocation of land to perennials and annuals in an overall village (or community) context and individual farm context. The spatial dimension of these arrangements (e.g., a block of community forest land or maintaining trees on private field borders), proportions of space for perennials and annuals and relative composition of naturally growing or planted species vary according to changing availability and productivity of land, availability of alternative options (e.g., chemical fuels or fertilizer as against their biomass-based counterparts), and economic and technological changes influencing land use.

Agroforestry (planting perennials along with annual crops) in a way represents a compromise between extensive land use (possible under a low population pressure sit-

uation) and intensive land use (forced by the current demographic situation). Besides, this helps to ensure the availability of and access to biomass in the absence of vast uncultivated lands.

**Farmers' Strategies: Focus on Biomass**

To understand the fundamental importance of perennials (from forests), which necessitated their incorporation in private farming through agroforestry, a brief discussion on farmers' resource management and production strategies will be useful.

*Fertility Maintenance*

An essential component of traditional farming systems in mountain areas has been the emphasis on maintaining soil fertility through internal resource regeneration (Whiteman 1988). Without the input of chemical fertilizers, the fertility levels of the light and shallow mountain soils are heavily dependent on the addition of farmyard manures and forest litter.

Farmers have devised numerous ways to replenish soil nutrients and protect fields from the loss of soil through erosion. Terracing is the most visible modification that farmers of the HKH have made on hill slopes for soil conservation and cultivation. A crop rotation system with a fallow period allows the regeneration of soil health by ploughing in crop residues and allowing for a resting period. The high altitude farmers of Bhutan burn straw that has been placed on croplands to provide potash, destroy weeds, and warm the soil before ploughing and sowing. Intercropping legumes with crops is another technique used to increase fertility; soil is conserved through more complete plant coverage and root activities.

However, by far the most widespread and significant strategy for maintaining soil fertility is through the transfer of nutrients from forests and grazing lands via livestock. The fodder element is the linchpin in the farming systems of the hills and mountains. In the form of grass and fodder leaves, biomass is recycled through cattle, sheep, goats, buffaloes, and yaks to produce the valuable manure on which crop productivity depends. Crop residues also contribute to feed resources, and forest litter is incorporated into the compost as well, but fodder from trees and grasses constitutes well over 50 per cent of the diet of livestock on an annual basis. Seasonal fluctuations in supplies result in livestock being fed mostly green feed in the summer months and crop residues after the harvest season.

*Provision of Products*

In addition to the provision of tree and grass fodder, forests are often the sole suppliers of timber and fuel. Far from the urban centres, where kerosene, charcoal, and electricity are available, mountain families depend on another free resource from the forest—fuelwood. Even in the sparsely vegetated arid highlands of Pakistan, most families must struggle to collect fuelwood from far-off 'forests' consisting of scattered trees. Grass peat is the fuel used by West Sichuan mountain households.

Bhutanese farmers supplement their otherwise simple diet of rice, millet, and chillies with mushrooms, tubers, and fruit from the forests. Many mountain residents depend on herbal remedies from forest plants to cure illness. Fencing, thatching, and construc-

tion materials all come from communal forest lands (even land legally owned by the government is here termed community land, based on its de facto use status).

*Hedging against Risk through Diversification*

With the primary objective of hedging risks and securing the provision of basic food supplies, a basic strategy employed by farmers is to diversify production. Crop/livestock-based, mixed farming, backed up by heavy use of forest and pasture resources, facilitates the flow of varied products throughout the seasons. Besides supplying organic fertilizer and draft power, livestock are used for milk, meat, eggs, butter, cheese, and hides. A very important advantage of livestock-raising for the small farmer is the fact that animals and products can be sold for cash at any time. Vegetables and fruits may also present cash-earning opportunities, but the transport of these to markets is more problematic for farmers without access to roads. Moreover, the mobility of livestock means that a farmer's means of subsistence are not entirely tied to local conditions with their accompanying hazards of drought, hailstorms, or cold temperatures.

The operation and success of farmers' above-mentioned strategies are closely linked with the complementary use of private property resources (e.g., for private farming) and common property resources (CPRs) (e.g., CPRs such as community forests and grazing lands which ensure a supply of biomass not available on one's own farm). Hence, the decline of the commons as a source of biomass may adversely affect farmers' resource management and production strategies (Jodha 1990d). This is happening at a rapid rate as discussed below.

## PROCESS OF CHANGE

The biomass supplies and services crucial to the operation of farmers' above-mentioned strategies are dependent upon the availability of forest and grazing lands as common property resources. The changes in the status of the latter have significantly influenced the farmers' afore-mentioned strategies.

### Transformations Affecting Farmers' Strategies

Strategies and practices developed and used by mountain farmers under conditions of low demand for resources are becoming increasingly unfeasible and ineffective. Population growth, market forces, and public interventions have placed new pressures on the fragile resources of mountains and their natural environment. This, in turn, is leading to the unsustainability of the whole mountain farming system (Jodha 1990b).

*Population Growth*

The most important component of the process of change is population growth and its consequences for farmers' traditional resource management strategies. Population growth has strained the farmers' traditional strategies in several ways. Most importantly, in various direct and indirect ways, it has contributed to a reduction in the area of forests and pastures. Crop cultivation has been slowly extended to a large proportion of these areas. Even through over-grazing and over-extraction of supplies from the remaining CPRs,

people are not able to meet the increased demands of the increased population. Thus, from the biomass supply side, farmers' strategies are adversely affected by population growth.

From the demand side, increased population has forced farmers to employ more intensive use of their small landholdings. This calls for yield-raising inputs. Yield-raising chemical fertilizers are costly and non-available in most cases; the other option is to increase manure production. This needs additional animals, additional labour to feed and graze them, and, most importantly, additional feed material or space to graze the animal. This amounts to asking the impossible in the face of the already stated decline of area and productivity of CPRs and reduced fallow periods of croplands. In the context of the biomass situation, farmers are faced with the difficult choice of whether to select HYVs, which can provide an increased amount of food for human beings, or traditional varieties with high stalk-grain ratios that are therefore valuable also as sources of fodder.

*Backlash of Development Interventions*

Farmers' biomass-centred strategies have further suffered due to the backlash of modern development processes which are quite indifferent to the utility and value of biomass in farming systems. For instance, due to the strong focus of public support systems on limited crops and limited crop attributes (e.g., grain production mainly), the diversity of agriculture has been reduced. Emphasis on commercialization and cash crops has also reduced the importance of crop by-products and biomass in general.

The cash nexus has further induced farmers to over-extract the remaining sources of biomass (forests and pasturelands) for commercial purposes. This delinks the forest from the resource regenerative processes crucial for mountain farming systems. Evidence of over-extraction is visible everywhere. Sparse natural lands in the North West Frontier Province (NWFP) of Pakistan have been stripped bare through such extraction. Similarly, the trekking industry in Nepal has provided a ready market for fuelwood. Trekking tourists consume twice the amount of wood used by their porters (ERL 1989).

The introduction of modern crop technologies involves components (e.g., hybrid seed, fertilizers, pesticides, even tools and equipment) that are usually external resource-centred. Hence, they have little sensitivity to local resource regeneration and biomass stability. The importation of mechanical technologies designed for lowland conditions can prove harmful to fragile environments. Tractor cultivation, introduced in Bhutan (and other parts of the HKH Region as well) for cash crop production, for instance, increases erosion and discourages the planting of trees and bushes in fields and on field borders (Gupta 1986).

**Transformations Affecting Social Arrangements**

Historically, the stability of biomass supplies was also a result of the proper management and regulated use of CPRs. The traditional institutional mechanisms to enforce the same have slackened with the process of development.

Under conditions of overcrowding and overuse of resources, traditional management systems to regulate forest cutting and pasture grazing have broken down in many areas, notably in India and Pakistan (Jodha 1990d and Mulk 1990). The inability of community

leaders to enforce regulations and obligations on users to contribute taxes and labour has resulted in uncontrolled exploitation and poor maintenance of these resources.

As the hunger for land grows, it is almost impossible for the boundaries of communal forests, pastures, and marginal lands to remain unaffected. Encroachment on these lands has transformed their use patterns to those of crop cultivation. Privatization of sources of natural biomass for crop cultivation has been encouraged by public land policies (Jodha 1990d). The consequence of privatization is the loss of access for others to fuel and fodder supplies. This affects the rural poor more than any other group.

Apart from the large-scale privatization of CPR sources of biomass, public policies have also led to disruption of their management. In several cases, public interventions have been directed to replacing local village authority by formal administration from above. For instance, community forestry legislation in Nepal, by handing over plots of State-owned forest land to panchayats, has disrupted the existing forest management systems formed by smaller groups of local users. By providing a cash salary to forest guards, the government has superseded the authority of the user-group which had previously paid him in-kind. The guard becomes answerable to government forestry officials instead of to local users.

Through cooperation among all households and the feudal rulers (*mirs*) in Pakistan's northern areas, local institutional arrangements were evolved for the management of pasture and irrigation systems. The enormous labour investments required to maintain these systems, particularly hill irrigation systems, were possible only through sanctions and their enforcement by the *mirs*. The decline and abolition of their authority over the last four decades have led to a parallel decline in the effectiveness of village-level institutions (World Bank 1990). A similar situation has been observed in parts of India (Jodha 1990d).

These examples are indicative of the alienation that the State has created among villagers from their common property resources. Nationalization of forest and pasturelands has converted CPRs into government property resources. Unless communities can be assured that the products of such lands will be available to them to meet their biomass needs on an equitable basis, government initiatives to encourage community management will be subverted (Agarwal and Narain 1990).

## AGROFORESTRY AS AN OPTION

The above discussions show that the integrative role of biomass was the key element in the farmers' traditional strategies. Under a situation of demand on mountain resources, these strategies helped to sustain agriculture.

However, the recent forces of change have disrupted the institutional (and technological) arrangements conducive to uninterrupted supplies of biomass for effective operation of farmers' strategies.

The traditional systems, involving land-extensive and subsistence-oriented activities, are less feasible. The objective circumstances require increased use intensity of land resources. New crop technologies can help in this. But, because of the very nature of fragile land resources, increased use intensity without resource conservation/protection (possible through biomass, nutrient cycling) may prove counter-productive. Hence, the need for an approach that can blend land-intensive and land-extensive uses. In other words, a need for

options that can ensure the 'biomass-generating functions' of forests and pastures without having sufficient land under these use categories. It is in this context that agroforestry emerges as one of the potential options to reverse the emerging unsustainability trends in mountain agriculture.

In the context of mountain areas, agroforestry can not only help in performing some functions of the traditional CPRs, but it can also fit well into the circumstances characterizing mountain habitats. In fact, it is the latter attribute of agroforestry which makes it the more appropriate option for mountains in today's context of land scarcity, conservation needs, and pressure for higher production. To elaborate on this we may briefly discuss specific characteristics of mountain areas vis-a-vis the attributes of agroforestry as a system of land use and cropping.

## Mountain Specificities and Imperatives for Agroforestry

Farmers in mountain areas occupy a habitat that imposes a set of constraints and opportunities which differ widely from those of the lowland areas. Physical isolation, distance, transportation difficulties and costs, climatological and environmental hazards, limited production opportunities, and diverse agro-ecological conditions are some of the factors affecting mountain farming systems. These can be grouped under the following categories of mountain specificities as outlined by Jodha (1990a): inaccessibility, fragility, marginality, diversity, 'niche', and human adaptation mechanisms.

These mountain characteristics, to be elaborated upon later, generate a number of objective circumstances. Any intervention that helps in handling these circumstances or has the potential to benefit from these circumstances is likely to be more relevant and effective in the mountain areas. Table 33.1 illustrates this point with reference to agroforestry as an intervention for the development of mountain agriculture. In column one, the table lists the important operational implications of different mountain specificities. In column two, relevant attributes of agro-forestry as an activity are listed. The information helps to see the degree of convergence between requirements imposed by mountain conditions and production-cum-development possibilities associated with agroforestry. Table 33.1 also lists a few imperatives of the above-mentioned degree of convergence for agroforestry interventions. The latter can be used (as attempted towards the end of the paper) for assessing the relevance of recent agroforestry programmes in mountain areas. The issues mentioned above can be elaborated with reference to individual mountain specificities.

Agroforestry, based on the complementarity of annuals and perennials, has potential for local resource regeneration and recycling. It reduces dependence on external inputs also. Accordingly, it greatly matches with the requirements of relatively inaccessible habitats.

However, to benefit from the potential of agroforestry in inaccessible areas, the focus on choice of species and programme management (e.g., through a decentralised approach) will have to change. Such imperatives can be worked out in detail for specific locations.

### *Inaccessibility*

The most obvious feature of mountain areas, inaccessibility, is a result of altitude, slope, terrain conditions, and periodical seasonal hazards, such as snow, storms, and landslides, that impede mobility. Isolation, distance, poor communication logistics, relative

closedness of the system, with a tendency towards limited dependence on external inputs, and focus on local regeneration and recycling of inputs and products are important manifestations of this mountain specificity.

Agroforestry, as a system of land use, potentially facilitates the harnessing of complementarity between annual and perennial plant-based activities and helps in local resource regeneration processes with little external dependence. This potential can be more effectively materialized, provided both technological and institutional measures under agroforestry interventions are focussed accordingly. Table 33.1 indicates the broad directions for this purpose.

**Table 33.1. Areas of convergence between implications of mountain specificities and attributes of agroforestry**

| Mountain specificities/ implications | Relevant attributes of agroforestry | Imperatives for agroforestry interventions |
|---|---|---|
| *INACCESSIBILITY* | | |
| Closed system, poor transport logistics; limited external input dependence, focus on local resource use recycling. | Complementarity of annuals and perennials; local resource regeneration; nutrient/moisture cycling. | R & D focus on species with maximum complementarity; least dependence on external input/ market. Decentralized operational approach to agroforestry programmes. |
| *FRAGILITY* | | |
| Rapid resource degradation with use intensification; limited production options, low resource productivity. | Higher resource use intensity with conservation through annual-perennial (tree, shrub) inter-cropping, balancing extensive-intensive usages. | Focus on tree species with high soil-binding/soil-building potential; and positive (nutrient-, moisture-, shade-related) impacts on crops. Location specific differences in programmes. |
| *MARGINALITY* | | |
| Problem soils (due to low fertility, unmanageable topography, etc.), low productivity; people's poverty, risk aversion, low resource base, subsistence orientation | Usability of micro-level (plot) variability of resource base; gradual and upgrading resource/productivity; multiplication and diversification of production options for risk reduction, with limited out-of-pocket cost; contribution to input product recycling. | Focus on species with wider adaptability; multiple uses, varied maturity/harvest cycles; potential for soil building, resistance to physical hazards. 'Target group' orientation of programmes. |
| *DIVERSITY* | | |
| Biophysical heterogeneity as basis of diversified interlinked activities, source of stability and resilience of farming systems. | Potential for activities/ products/land uses with non-covariate flows of products and input needs; diverse and multiple products and interlinked second-level activities; fuller use of micro-environment, seasonality, etc. | Focus on species with wider adaptation, multiple uses, variable characteristics (maturity, input needs, rationing, tolerance to stresses, etc.); decentralisation, area/group specific changes in programme contents, |

Table 33.1 Contd.

| | | |
|---|---|---|
| *'NICHE'* | | |
| Mountain areas' greater suitability for specific activities/ products as source of comparative advantage. | Scope for harnessing environmental/resource-related uniqueness of mountains through use of specific perennials by incorporation in inter cropping. | Search for and use of species unique to mountains, focus on quality and performance improvement, their adaptation to inter-cropping situation. Programme focus on high value, processing, and marketing potential of agroforestry components. |
| *ADAPTATION MECHANISMS* | | |
| People's resource management and sustenance strategies directed to stability of food and biomass through interlinked, diversified land-based activities, collective management recycling; and adjustments to collapse of traditional arrangements (e.g., common biomass). | Conducive to diversification of interlinked, land-based activities with multiple products and services; neutral to scale of operation; group action no precondition for success. | Focus on species, productivity, etc. to be guided by both subsistence and market needs; farmers' adaptation to wider market economy requires element for market orientation of agroforestry programme. |

*Source*: Adapted from N.S. Jodha, 'Economic Development in the Himalaya: The Missing Mountain Perspective' (ICIMOD Internal Document, 1990).

*Fragility*

Fragility is a condition that results from the geologic, edaphic, and biotic factors associated with steep slopes and high altitudes. It makes the natural resources or ecological system vulnerable to rapid or irreversible degradation even with slight disturbances.

By implication, this makes land suitable for only low intensity uses (e.g., forestry as against intensive annual cropping). This restricts the range of production options and limits the input absorption capacity as well as the productivity of land.

Agroforestry, owing to the involvement of a mixture of annuals and perennials, offers a compromise solution for such lands, where use intensity of fragile lands could be enhanced without exposing them to rapid erosion as under pure annual cropping. However, as indicated in Table 33.1 effective balancing of intensive and extensive uses of land through agroforestry can be achieved, provided the interventions in this area are fairly location-specific and have an explicit focus on the attributes of species (both crops and trees) that are conducive to soil building and soil binding, besides providing sufficient economic returns.

*Marginality*

The feature of marginality often infers being outside of the mainstream processes that occur in the larger socioeconomic, and political area. In this sense, marginality is something that counts least in decision-making processes.

The term may also refer to the condition of biophysical resources. Any resources that are too fragile, too unproductive, and too unattractive to be worthwhile for any use could be described as marginal. Both natural and man-made circumstances contribute to the marginal status of any resource or any community. Such circumstances are many in the mountain context.

Most of the operational implications of marginality (as far as they relate to biophysical resources) are similar to those of fragility. When related to socioeconomic marginality, the implications are manifested by poverty, neglect, and exploitation by the mainstream decision makers, and little participation in decisions affecting the self.

While highlighting the relevant attributes of agroforestry one can again refer to the biophysical and socioeconomic dimensions of marginality characterizing mountains. In discussing biophysical marginality, the attributes of agroforestry that match with the requirements of fragility may be mentioned. Besides, agroforestry, both because of resource regenerative attributes and the potential for high pay-off options, can help in upgrading the marginal resource base. Regarding socioeconomic marginality, some features such as scale-neutrality of the system, diversification potential for hedging against risk, contribution to resource/product recycling, and limited out of pocket cost may be mentioned. For these features, agroforestry can suit the needs and means of poor people. However, to achieve such goals, the choice of species with enough variability in specific plant characteristics and a 'target group' orientation of agroforestry programmes will be essential (Table 33.1, col. 3, row 3).

*Diversity*

This characteristic refers to the immense variation relating to different mountain specificities and their components, within and among the ecozones of mountain regions. This contributes to the extreme heterogeneity of production and of living environments, animal and plant life, as well as socioeconomic groups and their survival strategies.

Diversity is the source of a complex of constraints and opportunities for interventions in mountain areas. The response to diversity takes the form of diversified and interlinked activities that are a source of the stability and resilience of farming systems in the mountains. However, the conventional development interventions, with their bias for uniform and standardized contexts, often treat diversity as a major constraint to development through replicating options evolved in non-mountain situations.

Agroforestry, depending upon the choice of components (i.e., species with varied characteristics) offers the opportunity to fully respond to the diversity of land resources and production environments. It can encourage land uses and production activities with non-covariate flows of products and input needs (e.g., in the case of trees and annual crops), and can provide a basis for diversified, interlinked second-level (i.e., agroprocessing) activities.

The major imperatives of the above discussions for agroforestry development interventions would call for a focus on species that meet diverse requirements and group or location-specific variations in the programme contexts (Table 33.1, col. 3, row 4).

*'Niche'*

Mountain areas are endowed with resources and an environment that make some activities and products extremely suited to them. In these activities (e.g., potential for irrigation and hydropower, timber production, and horticulture), mountains potentially have comparative advantages over the plains. If properly harnessed they may help in the sustainable development of mountain areas. If over-extracted (as usually happens) they may lead to resource degradation.

Some of the minor 'niches', based on perennial and even annual plants, offer unique opportunities for harnessing through agroforestry. This potential can be harnessed through specific focus on unique and high-value species which could fit into the intercropping of annuals and perennials. Their advantages could be further enhanced if agroforestry initiatives are supplemented by programmes in the field of processing and marketing (Table 33.1, col. 3, row 5).

*Adaptation Mechanisms*

Mountain people have devolved their own resource management and sustenance strategies. They evolve measures to amend mountain conditions (e.g., by terracing and irrigation) or adapt to the conditions (e.g., by choice of diversified, interlinked activities). The strategies involve both technological measures (e.g., ethno-engineering and folk agronomy) and institutional arrangements (e.g., provision of collective risk-sharing and common property resources).

Agroforestry, as indicated above, offers opportunities for the above two-way adaptation processes. Diversification and the potential choice of multipurpose options are conducive to such adaptations. Thus, there is a wide range of convergence between attributes of adaptation strategies and agroforestry systems. In fact, indigenous agroforestry is based on such convergence.

The degree of convergence can be increased through focussed public interventions. In fact, with the right focus, agroforestry can help meet subsistence needs and can encourage farmers' participation in the wider market economy. Viewed in this way, agroforestry could be a useful intervention for the transformation of mountain farming from a subsistence system into a semi-commercial system (Table 33.1, col. 3, row 6).

## Some Agroforestry Interventions with Reference to Implications for Mountain Area Development

Much of the work done on agroforestry systems in the HKH region is limited to research on species' trials and descriptions of indigenous practices. Literature outlining the strategies and impacts of government and private interventions in the field of agroforestry is scanty and diffused.

Government-sponsored agroforestry programmes are apparently far more common in lowland than hill or mountain areas, according to a preliminary survey of existing projects in India, China, Nepal, Pakistan, and Bhutan. A further investigation of programmes in the mountain regions of these countries is ongoing (ICIMOD, in press). Samples of a few agroforestry interventions initiated by governments, NGOs, donors, and, indirectly, by market forces are described here to examine their relevance to mountain conditions.

*Multipurpose Tree and Fodder Production by Village Organisations in Remote Areas*

The Aga Khan Rural Support Programme (AKRSP) in Chitral, Gilgit, and Baltistan, Pakistan, offers technical and managerial assistance for farmers living high in Pakistan's mountainous northern areas[1]. AKRSP has recently initiated a programme to encourage

[1] Derived from The Aga Khan Rural Support Program: Second Interim Evaluation. Washington, D.C.: World Bank, March 1990.

multipurpose tree planting on both public and private lands. A variety of species, including poplar, willow, and an exotic leguminous species, are produced in decentralized nurseries operated by village organizations (VOs). Fruit tree planting, long a tradition on the irrigated lands of this region, is done in a system of intercropping with alfalfa and vegetables to increase soil fertility and to generate an income source. The fruit trees themselves provide fodder and fuel from loppings and prunings.

The project provides seeds to encourage the traditional practice of planting alfalfa on newly developed (irrigated) lands. The AKRSP staff and farmers are conducting trials on new fodder legumes and appropriate management systems. Fodder cultivation is encouraged through the introduction of alternative crops and tree species, and free grazing of livestock is discouraged, by the VOs. The quality and digestibility of cereal straw feed is being improved through urea supplements and a new practice of chopping the residue into smaller pieces.

The success of AKRSP's initiatives in the area of agrisilvopastoral agroforestry, as for its other activities, may rest largely on the strength of the VOs and reliance on them for technology transfer. The programme has been responsible for a great increase in the availability of improved seeds and fertilisers through provision of credit and supplies. The construction of the feeder roads linking the area to the Karakoram Highway and the input supply system encouraged by the AKRSP have significantly reduced the negative impacts of inaccessibility. The project's emphasis on the development and maintenance of irrigation systems has allowed subsequent investment in the production of complementary annual and perennial crops for food and fodder.

Virtually all agroforestry production in the area is dependent on irrigation facilities. This focus has reduced the constraints posed by the inherent marginality of this remote region, strengthening the resource base and permitting more intensive land use.

Against this backdrop of improved accessibility to markets, technological inputs, and water resources, AKRSP's agroforestry activities aim to diversify production, build soil fertility, provide sources of income, and improve local timber, fuelwood, and fodder resources all through the actions of VOs and based on locale-specific needs and opportunities (World Bank 1990).

Viewed in the context of agroforestry development imperatives, the AKRSP programmes, described above match fairly well with the requirements of mountain specificities. In other words, they have a strong mountain perspective.

*Pastureland Improvement with Low Levels of Input*[2]

In Bhutan, a country with two-thirds of its land under forest cover and a sparse population, the need for agroforestry interventions *per se* has not arisen (although the indigenous method of shifting cultivation is still widely practised). Most farm households in the mountainous region are within a close distance from forests which are used for the collection of timber and fuelwood and as grazing lands for livestock. However, the overuse and deterioration of pasturelands is becoming increasingly obvious, particularly in the south where migrating herds of cattle are concentrated in the winter months. These

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[2] Information from Country Programme: Swiss Cooperation with Bhutan Helvetas. Bern: Swiss Development Cooperation, 1989, and Helvetas, *A Study Tour to Bhutan*. Kathmandu: Integrated Hill Development Project, 1990.

lands, unsuitable for cropping due to their steepness and thin soils, are particularly fragile and easily damaged by trampling.

The Royal Government of Bhutan (RGOB), with assistance from a Swiss donor, Helvetas, has initiated a livestock and Fodder Development programme, under the Animal Husbandry Department, to improve the productivity of livestock through an integrated approach. The programme focusses on 'scientific breeding', better feed resources, improved management, and effective animal health care. The secondary objectives are to establish a marketing system for dairy products and to reduce cattle migration. The government recognizes that activities to upgrade livestock conditions must also include measures to prevent ecological damage to grazing lands.

Given the shortage of manpower in Bhutan, the programme has encouraged the adoption of low labour input practices to cultivate food and forage crops together. Buckwheat and clover seeds (plus fertilizers) are sown simultaneously on communal pasturelands that have been apportioned off to private farmers. After harvesting the buckwheat crop, which has benefited from the nitrogen-fixing abilities of the clover, the plot is already established as productive pastureland. Clover will provide soil fertility and soil protection for several years, requiring no additional input of labour. This intercropping system, however, has no explicit place for perennials and is therefore not a true example of an agroforestry system. In many areas, forests surround large areas of grazing land, and bamboo is a common pastureland species.

The RGOB/Helvetas programme promotes the production of forage grasses in recognition of the 'niche' provided by these steep, sloping highland areas for the support of livestock production and to provide a marketing potential for dairy products. The fragility of such lands is well understood, so that species are selected for their ability to improve soil stability and soil nutrients. The constraints posed by labour shortages are also attended to.

However, despite RGOB's commitment to the guiding principles of decentralization, people's participation, and self-reliance, this programme depends heavily on the plans, technical advice, and inputs of seed and fertilizer from experts situated far from the site of the improved pasturelands. There is no evidence of an attempt to incorporate the traditional adaptation mechanisms of farmers, such as knowledge of indigenous grass species or existing social arrangements, to manage pasturelands (Helvetas 1990).

The above example indicates the sensitivity of public interventions to at least some of the important mountain specificities such as fragility, marginality, and 'niche'.

### *A Market-oriented Agrisilvopastoral System: Cardamom Plantations in the Eastern Himalaya*[3]

Large cardamom is a plant native to Sikkim, where it grows under shade trees and is used as a spice and medicine. Originally, it was collected from natural forests, but, with the decline in area and density of trees in Sikkim's forests, farmers have begun to cultivate it on gentle sloping and steep-sloping lands. Today, 27 per cent of the land of Sikkim under agricultural production is used for cardamom cultivation. Most plantations are less than one hectare in size.

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[3] Derived from K.A. Singh, R.N. Rai, Patiram, D.T. Bhutia. 'Large Cardamom (Amomum subulatum Roxb.) Plantation—An Age-old Agroforestry System in Eastern Himalaya'. In Agroforestry Systems 9:241–257, 1989.

Because cardamom requires an over-storey for shade, farmers plant various species of fuelwood, timber, and fodder species. Alder (Alnus) is the most common associated species; it is fast-growing, deciduous, and nitrogen-fixing. Therefore, it quickly provides shade, enriches the organic matter fertilisers for cardamom, and also yields fuelwood that is useful for the curing process.

In the middle hills of Sikkim, where milk production is the aim of the farming system, the planting of fodder trees instead of Alnus is increasing. Fallen leaves increase the soil's organic content, rendering it unnecessary to apply manure or fertilizer. The trees are lopped after the cardamom harvest at a time when there is a shortage of other green fodder material.

Cardamom is thus a low input crop with no need for tilling, manure, fertilizer, or pesticides. The Government Spice Board gives extension services and improved planting materials plus subsidies for fencing and replanting. The farmer's gross financial returns from cardamom cultivation are equivalent to those of rice production, but the profit margin is higher on account of lower input into the system.

This agrisilvopastoral system is well suited to the fragile lands of the steep-sloped Eastern Himalaya. With no ploughing of the soil and little removal of vegetation or woody biomass, the system resembles an undisturbed natural forest ecosystem. Tree species are selected for their complementarity to the cardamom system, to provide protection from the impact of sun and raindrops, to improve the soil base through leaf litter and nitrogen fixation, and to increase moisture retention through the infiltration and recharging of rainwater.

As the access to State-owned forests is curtailed by legislation, the secondary products of fuelwood, fodder, and timber have gained in importance.

The cardamom system demonstrates an appropriate use of the comparative advantage Sikkim has to produce a high-value, easily transportable product with a high market demand. Cultivation of the crop is ideal in that it provides for both subsistence and market-oriented systems in an ecologically sustainable way on marginal lands.

Although not an intervention of the government as such, the popularity of cardamom production is a direct response by farmers to market opportunities and other support offered by the government. As its production system is well known to Sikkimese farmers, little intervention is necessary to popularize cultivation or adapt the system to local conditions (Singh et al. 1989).

*Promoting Agroforestry among Marginal Upland Farmers*

Action Aid Nepal (AAN) has been implementing an integrated rural development programme in a mid-hill and high hill region of Central Nepal since 1982.[4] The organisation has identified food deficiency and non-sustainable agricultural production as the primary causes of poverty in the area, and has thus developed an approach to minimize dependency on external inputs, boost productivity, and create sustainable agricultural systems. Programme interventions include farmer-based research, farmer awareness-building, encouragement of local seed producers, improving quality and availability of compost manure and organic alternatives to chemical fertilizers, improving quality and quantity

[4] Described in *Action Aid Nepal Progress Report (July 1988–June 1989) and Annual Management Plan.* Kathmandu: Action Aid Nepal, July 1989–1990.

of fodder, increasing livestock productivity, and providing alternative cash crop opportunities.

Farmers are motivated through literacy classes and meetings of grassroots groups to plant fodder trees on marginal land and terrace risers, and to stall-feed their animals. Improved grasses, including legumes, are introduced and propagated in grass nurseries for distribution of seeds and vegetative cuttings. These activities are closely linked to those of the livestock programme; farmers receiving improved breeds of cattle and goats are required to grow a specified quantity of fodder trees and/or grasses. Fodder seedlings of local species, according to those preferred by the farmers in the area, are raised in community nurseries managed by groups of trained and interested farmers. Women, as the target group of AAN's agricultural programme, often manage these nurseries.

Farmers of one area adjacent to an extensive tract of government forest have become avid tree planters on private lands after strict closure of the forest by the army denied them access to their sole source of timber and fuelwood materials.

Fruit tree and cardamom production are two activities aimed at increasing cash crop opportunities for the area's poorest farmers. Fruit trees are planted near homesteads and on nearby field borders, while cardamom is cultivated under alder tree groves in gullies and other marginal lands. AAN's strategy to reduce dependence on external inputs solves the problems posed by inaccessibility and makes its programmes relevant to the cash-poor marginal farmers who form the main target group. The focus on fodder production is to strengthen the weakest link in the farming system while improving the ecological base. Soil erosion losses from fields can be reduced by planting trees and grasses on otherwise barren terrace risers; stall-feeding reduces trampling and grazing on marginal lands, already prone to high erosion rates, and allows the natural regeneration of such lands. The promotion of local species taps the farmers' extensive knowledge of fodder trees and provides them with diverse options for planting.

The programme's reliance on community groups for motivation and extension, particularly those formed around the common intent to learn literacy skills, is its strength. AAN possesses the skills in community organization to form and work with true users' groups, and to plan and implement activities in a decentralized fashion with high levels of farmer participation (Action Aid Nepal 1990).

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