

High Value Cash Crops in Mountain Farming Mountain Development Processes and Opportunities

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Preface

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This current discussion paper is part of the Mountain Farming Series, "High-value Cash Crops in Mountain Farming Systems," which was presented at the "Regional Conference on Sustainable Development of Fragile Mountain Areas of Asia" which took place from December 13th to 16th, 1994, in Kathmandu, Nepal. Support for this Conference came from the Swiss Development Cooperation, FAO, UNDP, UNEP, and the UNU.

The unanimous concern expressed at this conference was for the deteriorating conditions of both the environments and livelihoods of mountain people. Mountain development had not been geared to the people nor the environment it purported to serve.

One of the achievements of the conference was a wider sharing of knowledge amongst the mountain countries of Asia and insight into the constraints that confronted them and the opportunities offered by the wide diversity of their special mountain environments. Another significant achievement was the formulation of a Call to Action on the Sustainable Development of Mountain Areas of Asia, or SUDEMAA recommendations.

By publishing the conference papers in its various discussion paper series, ICIMOD seeks to share the knowledge gained with a wider audience. This current paper should be of interest to all those who are working with or concerned about the positive transformation of mountain farming systems.

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HIGH-VALUE CASH CROPS IN MOUNTAIN FARMING

Introduction

Mountain farming is broadly defined as all land-based activities, such as cropping, horticulture, animal husbandry, forestry, and their interlinkages, and is the prime source of sustenance of the mountain populations. Farming is also the prime user of the natural resource base and production environment in mountain areas. Currently, mountain agriculture presents the two following scenarios:

- i. A predominant scenario of subsistence farming in which there is deterioration in both the economy and the environment.
- ii. The emerging commercialisation of agriculture through cash crop farming, with hope for the positive growth and economic prosperity of mountain populations.

Unsustainable Subsistence Agriculture in the Mountains

In large areas of the mountains, the resource base of mountain agriculture has visibly deteriorated. This is manifested by a decline in the per capita availability of crop land, reduced availability of village commons also called supportland, declining soil fertility, deforestation, and a decline in the carrying capacity of these areas (Jodha 1993, Jodha and Shrestha 1994).

On the resource management front, there is a high degree of desperation in the people's approach to resource base use as well as in community interactions. Extending cropping to fragile steep slopes and discarding resource regenerative and resource recycling practices (e.g., intensive farming, overgrazing, and acceptance of relief or subsidies as a norm of survival) are some of the indications of the mountain farmers' desperate responses and inferior options to the deteriorating process (Dev 1994, Shrestha and Yadav 1992). Farmers are also placing greater emphasis on meeting short-term needs rather than on concern for the future. Other emerging symptoms of unsustainable subsistence agriculture in the mountains are the necessity for more hours of drudgery to meet subsistence needs (for food, fuel, and fodder) as a result of shrinking supplies, and the seasonal or permanent migration from crisis areas (Shrestha 1992, Dev 1994).

Looking at the crop production environment of mountain agriculture in particular, one notices increasing reports of steady decline in crop yields (5-30%) or stagnation over the past few decades (Swarup 1991, Partap and Watson 1994, Panday 1992). This has caused food shortages of varying

degrees among mountain families. An analysis of reports on inadequate food production by farm families in several poor areas in the mountains reveals that the production of adequate amounts of food crops on small landholdings, with ever declining farm productivity, is impossible (Panday 1992). Food shortage in the mountain areas has set in motion a chain reaction towards an integrated process of poverty - resource degradation - scarcity - poverty (Banskota 1992).

In a nutshell, without access to economically superior cropping systems that use improved technology and high payoff inputs, the economic and social conditions of mountain populations and the dependence on subsistence farming in the hills/mountains are generating greater problems of environmental and natural resources' degradation. Reports indicate that wherever cash crop farming has not been adopted the importance of mountain agriculture as a source of sustenance for the people is rapidly sinking (Vaidya and Sikka 1992, Yu and Chen 1992).

Commercialisation of Mountain Agriculture

Another trend unfolding in parts of the Hindu Kush-Himalayas and mountains in Asia is the growing commercialisation of mountain agriculture (Verma and Partap 1992, Liu et al. 1992, Lin 1992, Koirala 1992). This represents the efforts of mountain farmers to use scarce land resources more efficiently for gainful employment and increased incomes. The cropping approach is based on cash crop farming and intersystemic linkages; new forms of diversification (activities); using inputs from science and technology; and building sound upland-lowland linkages. This emphasis on high-value cash crop farming by some mountain communities is succeeding in bringing these people out of the poverty trap in some areas, and the same process is underway in other areas. The overall economy of these areas shows signs of food security and some measure of economic well being (Sikka and Saraswat 1990, Singh 1990).

The nature of the concern and the expectations of the people of these relatively transformed areas are different. The emphasis is on the need for containing the backlash effects of commercialisation and sustaining cash crop farming. There are definite instances to show that, in addition to refurbishing the mountain economy, appropriate cash crop combinations (e.g., cardamom and *Alnus*) also help promote environmental conservation in certain parts of the mountains (Koirala 1992, Denholm 1991). The diffusion of this development process into other mountain areas is high on the agenda of several national and provincial governments.

From these two scenarios, one dominant and disappointing and the other smaller but promising, one finds that cash crop farming is emerging as a promising approach to the overall development of mountain agriculture. While the basic philosophy of cash crop farming is similar in all areas, the crop components vary among different agroecological regimes.

High-value Cash Crop Farming : Experiences from the Hindu Kush-Himalayas

The Success Stories: Improved Economy and Better Living Standards

Given contemporary realities and constraints, there seem to be few alternatives to cash crop farming in the hills /mountains for communities to gain access to improved incomes from farmland. In the past few decades, the importance of high-value cash crops for improving the economy of mountain populations has been realised in several pockets of the Hindu Kush-Himalayan Region. Some of the high-value cash crops have specific agroclimatic and soil requirements which provide unique opportunities for mountain people to produce unprocessed, semi-processed, and processed fresh and dry fruits, vegetables, spices, mushrooms, aromatic plants, medicinal plants, and flowers (horticulture). The promotion of horticulture, which has several of the components of cash crop farming, has also received attention in the development priorities of many mountain areas of the HKH countries, but not all areas have succeeded in cash crop farming. Two select and outstanding success stories from the HKH region are briefly narrated here to highlight the socioeconomic impact of cash crop farming.

Himachal Pradesh: Improvements in the economy and quality of life of farming communities, particularly apple and vegetable farmers in Himachal Pradesh, is widely acknowledged as a successful experience in cash crop farming (Sikka and Saraswat 1990, Singh 1990, Singh and Sikka 1989). The majority (75%) of farm families in the Himachal Pradesh apple-growing area belong to small and marginal farming categories (0.5-2 hectares). After switching to apple and vegetable growing in the past few decades, the quality of life of these people today is reflected by their very high level of income, consumption patterns, education, and other human/social welfare services (Verma and Partap 1992).

After a few years of cash crop farming, these farmers started receiving gross returns of US\$ 4,500 per hectare and net returns of US\$ 2,000-2,700 (Sikka and Saraswat 1990). On an average, marginal farmers (0.5-1 ha of farmland) earned annual net returns of US\$ 1,600 and for the small farmers' (1-2 ha of farmland) maximum annual net earnings were up to US\$ 4,000 (Sikka and

Saraswat 1990). These incomes are much higher than any earned through any other farming means in this area. Such good earnings over the years have helped to raise these farmers well above the poverty line. By making substantial savings over the years, farmers are in a position to bear the risk of crop failures in some years, to purchase all food items, and spend liberally (50% income) on non-food items, education, and luxury household assets. Another indicator of surplus income generation is that a village community of 100 households could make a net saving (bank deposits and investments) of over US\$ 4 million during the past decade (Sikka and Saraswat 1990). Similarly, farmers in other agroecological zones of Himachal Pradesh have benefitted from farming other cash crops, potatoes, and off-season vegetables (Singh 1990, Singh and Sikka 1989, Tiwari 1991). Many more similar successes have been reported in small pockets of the HKH countries (Lin 1992, Liu et al. 1992, Alam 1993, Teatitia 1993, Katwal and Shah 1992).

Ningnan County: Located in the eastern Himalayan region of China, the county represents a unique example of the success of cash crop farming. It shows how a poor area can improve its economy and change in a very short time (Liu et al. 1992). The farmers of this county managed to come out of the poverty trap. They benefitted from government commercialisation of agriculture, through sericulture, fruit farming, and other cash crops related to agro-industries. Sericulture is, otherwise, an activity which has largely failed in most parts of other HKH countries. From 1975 to 1977, when the initiatives for cash crop farming began, the per capita income of the county ranged between US\$ 5-12 (considered below the extreme poverty line in China). However, from 1990 to 1992, the per capita income had increased to US\$ 65-70; productivity in agriculture and industry had increased substantially; infrastructure had improved; environmental degradation had slowed down; and the people of the county had risen out of poverty and backwardness.

By focussing on cash crop farming, this county was able to create so many opportunities, both on-farm and off-farm, for the farming class that the local population could not meet the demand, and farmers from adjoining poor counties were officially invited to migrate to Ningnan. This initiative, attributed to good local leadership, seems unexpected in the prevailing scenario in the mountains.

Off-Farm Employment Opportunities

The off-farm employment implications of cash crop-based activities have also shown encouraging trends. Indications are that women have a relatively greater

participation rate (64%) in most cash crop-based, off-farm activities (Yu and Chen 1992). Female participation in off-farm activities is encouraged by two factors: female-oriented labour work and the requirement of lesser mobility: 50 per cent of horticultural activities, such as transplanting, tending, harvesting, and marketing, are carried out by women (Yu and Chen 1992). Thus, cash crop farming has encouraged a greater number of women to explore related off-farm employment opportunities.

The preceding section shows that the gross income from cash crop farming is very high compared to the net returns. This is mainly because of the labour inputs of the farm family, to which the major benefits also flow back in the form of off-farm employment. The total income of the family would, thus, be more than the indicated net returns from the crops. A sample survey in China revealed that about 30 per cent of the labour force was involved in off-farm activities within agriculture, and that 47 per cent of the labour time of the farm families was spent on various cash crop-related, off-farm activities. Off-farm activities within agriculture accounted for 52-63 per cent of the cash income of the farmers (Yu and Chen 1992). Studies also show that this income is being used not only to meet household subsistence needs but also a host of other needs and aspirations such as clothing, medical care, education, better housing, travel, marriage expenses, and other social and ritual obligations (Mehta 1990, Wang and Chen 1992).

Potential for Viable Living Standards on Small Farmlands

Population pressure in the mountain areas has also resulted in a substantial increase in the number of families. The scope for increasing the arable land area is limited, and this has led to the fragmentation of permanent agricultural landholdings among the families and a consequent increase in the number of marginal and small farmers throughout the mountains. For example, over a fifteen-year period (1970-85), the number of marginal (0.5-1h) and small (1-2) farm families increased by 42 per cent in Himachal Pradesh; raising their total number among the farming community to 75 per cent (Vaidya and Sikka 1992). The decreased size and increased number of landholdings have created a big challenge to find ways to make farming by these marginal and small farmers viable.

A study on the economic viability and potential of increasing the incomes from small and marginal farms (Vaidya and Sikka 1992) revealed that subsistence farming, which focusses on cultivation of cereals, was no longer viable for marginal and small farm families. Net returns from cereal farming on these small

landholdings have been abysmally low; for example, maize, a staple crop for subsistence farmers, gives a per hectare net return of about US\$ 20-25; paddy, US\$ 10-15, wheat, US\$ 30-35; barley, US\$ 2-3; oil seeds, US\$ 40-45; and pulses, US\$ 25-30. Meeting both farm expenditure and consumption expenditure of farm families with these meagre amounts was just not possible. Evidence from other mountain areas (Panday 1992, Carson 1992) shows that the production of adequate amounts of food crops is impossible from these small landholdings with ever declining farm productivity. Thus, small and marginal subsistence farmers now find themselves trapped in a non-viable subsistence farm enterprise, the very existence of which is threatened.

However, through shifts in cropping patterns to vegetable and fruit farming, there is increasing evidence of enhanced income from marginal and small farmlands. The same study which found marginal and small landholdings non-viable because of subsistence farming (Vaidya and Sikka 1992) observed that, through fruit crops, vegetable growing, and floriculture, it was still possible to make small landholdings viable as well as to enhance the living standards of threatened farm families. Compared to the poor returns from traditional cropping, reported in the preceding paragraph, promising returns from vegetable and fruit farming have been reported; for example, net returns from one hectare of tomato crops amounted to US\$ 2,000; cauliflower, US\$ 1,400; capsicum, US\$ 1,350; and ginger, US\$ 1,800 (Singh 1990, Singh and Sikka 1989). Improving the economic viability of small and marginal farmers in the trans-Himalayan areas of India, through the cultivation of off-season peas and seed potatoes, may be one of the outstanding examples whereby farm families are getting net returns of more than US\$ 2,000-3,000 (Singh and Sikka 1989). In the earlier section, we have already noted the very high income from fruit farming, making small-scale cash crop farming a viable farm enterprise in the mountains. With the same, or other, cash crops, similar benefits have been reported from other mountain areas of the Hindu Kush-Himalayan Region. Species such as cardamom fetch net returns of US\$ 1,000 -2,000 and medicinal plants between US\$ 1,500-4,00 (Wang and Chen 1992, Yu and Chen 1992, Lin 1992).

Productive Use and Management of Marginal Land Resources

A widely shared concern for the sustainability of mountain agriculture points to the marginal production potential of the land resource base. Barring a few valley areas, sloping farmlands with slopes of varying degrees are known for their poor productivity (Carson 1992). Combined with the small arable landholdings of the farmers, such a situation challenges farmers to find options

to make marginal lands productive (Partap and Watson 1994). In this respect, a very interesting trend of making productive use of marginal lands, both non-agricultural and agricultural, through various kinds of cash crop farming, particularly horticulture, is seen. The salient features of the horticultural development strategy of Himachal Pradesh are its successful conversion of the marginal agricultural land of farm families, the abundance of non-agricultural marginal sloping land (generally used as pastures and grazing lands) for very productive cash crop farming (Azad et al. 1988, Azad and Verma 1994), and its taking advantage of suitable agroclimatic conditions for fruit farming. Records of apple growing areas show that the fruit orchards of marginal and small farmers of these areas have been established by using more than 70 per cent of the barren, uncultivated land and only 30 per cent of agricultural land (Azad et al. 1988).

Perennial cash crops - trees and shrubs have the comparative advantage of tolerance to harsh environmental conditions such as steep rocky mountain slopes, frost-prone locations, and shallow soil conditions. Drought-resistant tree crops, such as almonds, which can survive in virtually waterless conditions, offer scope for cash crop farming under the most harsh agroclimatic environments in the mountains. Focussing on the sustainability aspects of farming, the potential of horticultural crops should not be underestimated in mountain agricultural development, as tree crops on marginal land offer the possibility of higher production and income. Generally, food grain production is around two tonnes per hectare under the climatic conditions of the Himalayan region, but the yield of apple trees is ten times that of cereal grains from the same area (Azad and Verma 1994). This establishes that tree crops have the potential to offer sustained high levels of productivity on marginal and fragile lands where annual crops cannot be grown profitably because the soil fertility is poor.

Contour trenching, to trap snow water on the bare mountain slopes in the trans-Himalayan districts of Kinnaur in Himachal Pradesh, has made possible the development of islands of apple orchards in the otherwise cold desert region above 3,000 m. The quality of fruit in this area is now fetching premium prices in the markets, and farmers are more than compensated for their hard work on these marginal lands. This strategy has proved beneficial for both the ecology and economy of the area. After the experience of fragile land improvement through fruit farming, more and more slopy desert areas are being converted into orchards.

Experiences in several counties of the Hengduan mountains, with dominant marginal land resources and the available natural conditions, have shown the

tremendous potential for medicinal plant cultivation on marginal lands. Farming of medicinal plants, e.g., *Shanmuyaochai*, has already shown considerable advantages since they can be grown on uncultivated, marginal land and dry hill slopes. Some areas, where agriculture is practised on marginal hill slopes above 30 degrees, at altitudes of 900-2,200m, traditional subsistence farming of maize, wheat, and potatoes is in the process of giving way to more remunerative cash crop farming of *Shanmuyaochai* (Wang and Chen 1992). Farmers are enjoying relatively high profit margins with net incomes ranging from US\$ 1,800-5,400 per hectare. It is a sizeable profit margin compared to returns from cereal crops grown on these marginal lands. The enthusiasm for medicinal plant farming in this mountain area has led to the adoption of several other medicinal plants, trees, shrubs, and tubers by the farmers. Large-scale mulberry plantations, on marginal sloping land and on the peripheries of farmlands, roadsides, and public places in China's Ningnan county, have become the very basis of a successful sericulture enterprise.

Farming with Comparative Advantage and Harnessing Niches

The diverse agroecological conditions prevailing in the mountains form niches for horticulture, floriculture, spice cultivation, and medicinal plants. Because of the agroecological requirements of these cash crops, some with wide and some with narrow ranges, these crops can be grown in the hills and mountains with a comparative advantage over the plains, which have an appreciable comparative advantage for growing cereal crops. Alternative cash crop farming in the right niche will give better returns to mountain farming communities. Mountain farmers receive two-fold benefits from cash crops: the first being agroecological, in the sense that particular cash crops can be grown only in particular climates; and the other, the comparative advantage of marketing, in the sense that products do not face competition from farming in the plains. Instead, the market is for mountain products and to facilitate access to food grains.

Building food self sufficiency by cultivating grain crops has not been too successful anywhere in the mountains. In fact, with the growing population, it may not be feasible at all to make mountain areas self-sufficient in food. However, there is now a clearer understanding that mountains can never have a comparative advantage in producing food grains and there is an increasing inclination to achieve food security through enhancing the purchasing power of farmers through cash crop farming.

High-value Cash Crops from Mountain Areas

The Cash Crop Concept and the Resources

There is a debate about the preferred cash crop concept for the mountains. There are high-value, low-volume cash crops; high-value, low-volume non-perishable cash crops; and the factual reality of the more commonly existing high-value, high-volume perishable cash crops. But the preferred concept is yet to become popular; much depends on the capability of research and development to come up with suitable alternatives. The precondition for fresh cash crops to succeed is the access factor. Wherever access was made possible, farming of bulky fresh cash crops proved successful. Since most cash crops, except, for example, medicinal plants farmed in China, have been introduced from outside, a lot of effort is needed to develop the requisite number of high-value, low-volume cash crops to suit diverse mountain environments with marketing potential. At present, much of the marketing potential is determined by the demand factor of the hinterland, which may still be a major factor in the identification of cash crops for the hills/mountains.

The cash crops currently cultivated in mountain areas are a mixture of both high-value, high-volume perishable types as well as high-value, low-volume non-perishable types. Both types can be grouped into horticulture, floriculture, oliculture, and medicinal plants. Among the fruit and nut cash crops; apples, peaches, pears, apricots, plums, cherries, walnuts, pecan nuts, hazelnuts, almonds, strawberries, raspberries, loganberries, and currants are cultivated under various mountain agroecological conditions. For example, the Hindu Kush-Himalayan Region has a monopoly on the cultivation of temperate fruits. One can also include several types of sub-tropical and tropical fruits in the category of hill fruits, since these are cultivated in the hills because of their comparative advantage of late maturity, bringing off-season marketing benefits. Besides fruits, a variety of temperate, off-season vegetables (grown during periods when they are not cultivated in the plains) have also become known for their high-value potential. These include tomatoes, cauliflowers, capsicum, peas, potatoes (particularly seed potatoes), ginger, and garlic. Of these vegetables, two or three crops are grown in a year at different elevations and under different agroclimatic conditions.

Although they fit the low-volume, high-value norm, only a few spice crops and essential oil crops have so far been successfully adopted as promising cash crops. Cardamom in eastern Nepal and the northeast Indian Himalayas, lemon grass in Bhutan, saffron in a small valley in Kashmir, and cumin in the high mountain district of Kinnaur are some examples from the Hindu Kush-Himalayan

Region. However, floriculture and mushroom cultivation have yet to become viable cash crop options. The experiences of the Royal Project in the northern areas of Thailand, which encouraged farmers to adopt floriculture, reveals that, because of the very nature of fresh flowers, quick access to markets is an essential factor, and this is difficult to ensure in most mountain areas. Much depends on the marketing support available for this farm enterprise.

Within the Himalayan region, there are a few examples of large scale medicinal plant farming. Farmers in the Lahul Valley of Himachal Pradesh have been cultivating *Saussurea (Kuth)* for decades, alongside their subsistence crops. The same area now cultivates hops, a new cash crop. Many medicinal plants in Nepal, Bhutan, Pakistan, and other parts of the Indian Himalayas are largely collected as wild plants. China is the only country with substantial experience in medicinal plant farming. Here, farmers cultivate a variety of medicinal plants, trees, shrubs, herbs, and tubers, under diverse agroclimatic regimes and farming conditions, e.g., *tung* oil (a tree crop), *Shanmuyaochai* (the three medicinal plants), laquer, and *Moyu* from Wenchuan County in the Hengduan mountains.

Narcotics' Farming in Mountain Areas

The value of opium and cannabis (hashish) crops, which offer very high value products for the underworld, is well known. Technically, the products of these two crops can be placed in the high-value, low-volume non-perishable category. Despite the best efforts of governments, the UN, and other international agencies, the 'illegal farming' of narcotic crops dominates in several mountain pockets in the Hindu Kush-Himalayan countries as well as other adjoining areas of the Asian mountains. The idea here is not to make a case for promoting the farming of these crops but to touch upon the underlying factors encouraging narcotic crop farming. The lucrative nature of the products of these narcotic crops; the ease with which these crops can be cultivated, with very little input on marginal lands and post-harvest handling; and a very good market encourage many mountain communities to farm these crops. There is also the fact that mainstream society has few attractive alternatives to offer these isolated farming communities in remote mountain areas. For centuries, these indigenous societies were left to fend for themselves with their unique and sustainable farming ways. A closer examination of narcotics' farming by these societies reveals that they are aware of the ills of narcotics. Some indigenous communities have developed social norms or informal institutional mechanisms to avoid the adverse effects of these otherwise lucrative cash crops. However, at present, narcotics' farming may be the only easily available option for

sustaining the livelihoods and economic well-being of farm families in these poor mountain communities. Because of the sensitivity of the issue of narcotics, nationally and internationally, most research and development institutions shy away from working on alternative uses for and better alternatives to these crops. Efforts in these areas focus mainly on enforcing regulatory mechanisms and educating people rather than on finding equally suitable alternatives.

How to Build a Pool of High-Value Cash Crops

Since the focus on high-value cash crop farming in mountain areas is of recent origin, efforts so far have focussed mainly on introducing crops from similar agroclimatic zones. Not much effort has gone into exploring and harnessing local resources for the development of cash crops. A wide variety of plant genetic resources exists in different mountain environments, with promising potential to become high-value cash crops. Efforts to harness local resources for sustainable farming may attract attention to the development of new cash crops that are ecologically friendlier to local farming environments.

In this context, replicable success stories may be one of the ways of finding new crops. Learning from farmers of other areas is the principle, e.g., the medicinal plant farming success story of Wenchuan County in the Hengduan mountains. After the county's economic reforms, particularly in 1980, the Wenchuan county government emphasised the promotion of apple and pepper farming. However, since the area did not have a natural niche for these crops, all the efforts failed. Then, around 1989, when villagers from the area visited a neighbouring county to observe its experiences in progressive farming, they were impressed by the potential of medicinal plant farming and they decided to introduce this in their own county. An all out effort to promote these new medicinal crops, *Phellodenidron* and *Encomia ulmoides*, was made. Thus, by replicating such successful experiences, the old crop of one area became a new crop for another, multiplying its potential cash crop choices.

Concerns for Sustainability in Cash Crop Farming

Infrastructure and Marketing Concerns

The productive areas of the mountains pose formidable difficulties in the handling and transportation of cash crops to markets. The infrastructure and services necessary to move cash crop produce from the point of production to

the point of consumption include, transportation, containers, storage, grades and standards, packaging, processing, and wholesale markets. Yet another problem is the fact that production areas are dispersed throughout the mountains. The majority of producing areas are subsistence farming areas and are inaccessible to transport networks and markets. Past experiences of success and failure have shown that cash crop farming of high-value high-volume cash crops, can succeed only if proper transport and handling facilities are available. If the facilities are not designed to transport bulky, fresh cash crop produce, it adds significantly to the farmers' losses. Poor transport facilities are, for example, responsible for a large proportion (25%) of damage and loss suffered by fruit and vegetable growers (Teaotia 1993). Nepal's experience in transporting apples from remote mountain areas by air or by porter has not been very successful. A similar case, from Ganzi county in the Hengduan mountains of China, reveals a failure to harness the potential of mushroom farming in the area because of its remoteness. Each year, Ganzi produces about 2,000 tons of fresh *songrong* mushrooms, *Tricholoma matsutake*, but sales in the region amount to only 800 tons a year. Since export of the produce from the area is difficult due to poor transport facilities, there is a glut in the local market which reduces the local price of mushrooms to rock bottom levels, resulting in poor returns to the farmers.

At present, various transport facilities are being used to bring horticultural products to market. While roads are the backbone of long-distance transport, ropeways have proved to be a very efficient means of transport for shorter distances and across the steep mountain terrain. At present most of the apples from the higher, inaccessible mountain areas of Himachal Pradesh are transported down the steep narrow valleys to the river side motorway by using ropeways. From there, the produce is transported by truck to wholesale markets in Delhi and other hinterland markets within 24 hours. This adds to the success of cash crop farming in this state (Singh et al. 1990).

Cash crop farming in the mountains abounds in examples of poor post-harvest practices, resulting in large losses of produce. Many reports have shown that an estimated 50 per cent of the fresh cash crops, fruits, and vegetables may be lost after harvesting (Teaotia 1993). Thus, the economic and energy losses are enormous. Containing these losses becomes absolutely essential to enhance income returns from cash crop farming without additional impacts on the farmland itself. Only if cash crop farming communities acquire appropriate knowledge and infrastructural facilities, for the conservation and management of cash crop produce after harvest, can substantial gains be made without endeavouring to increase production on the limited farmland.

Quality grading and standards are integral components of a good marketing strategy. Since mountain farmers have only recently begun entering into market-oriented farming, many of them do not have much experience in quality grading and standards. The problem of quality control is compounded by the fact that numerous small farmers are producing these products. Farmers feel that if they are to maintain the high standards of grading and quality of the produce, there will be too little left to sell to fetch enough cash. The question is whether these small, independently operating farm units can be regimented so that they are able to profitably produce the quality grades that good marketing demands. Similarly, storage is vital to avoid the adverse effects of market gluts, because the fresh fruit and vegetable seasons are short. The need for good storage facilities could become even greater in the future.

Lack of communication facilities in the mountains blocks the dissemination of market information to the growers, leading to gluts and poor prices. Dissemination is best performed with market information that is properly assembled and distributed to producers. At present, this is lacking in most parts of the mountains. The way in which blocked market information can harm cash crop farming is highlighted through an example from the mountain areas of West Sichuan, China, in 1990.

Dahurian angelica (*Angelica dahurice*) and *pilose asiabell* (*Codonopsis pilosula*) are two important medicinal cash crops of the area. Excessive production a few years before 1990 saturated the market, leading to poor sales. However, this information did not reach the mountain regions where farmers were still growing these plants. Subsequently, this resulted in huge overstocking, poor prices, and great losses to the farmers.

It is clear that the market is a determining factor for the success or failure of cash crop farming in the mountains. This points to the need for building institutional capacities that facilitate the development of organised wholesale markets to sustain cash crop farming in the mountains. While higher prices of cash crops would stimulate more production, sudden or constant falls in prices would abruptly break a developing cash crop farming economy in any mountain area, and most poor mountain farmers have yet to acquire a risk bearing capacity. Initial investments are necessary in cash crop farming and whether all farmers have the capacity to invest, or whether there is easy access to credit, are the questions which bear on cash crop promotion. Similarly, there are market-related risks leading to years of unprofitable production. In the absence of institutional support systems, many poor farmers will find it difficult to continue cash crop farming. At present, there are only a few instances in which there is institutional support to cover risks faced by farmers (Singh et al. 1990).

Monocultures and Environmental Concerns

Currently, cash crop farming strategies in mountain areas are directed towards self-sufficiency in those cash crops which are being imported and promoting cash crops which have a good export market. Therefore, the whole emphasis has been on crops that are well-known, highly developed, much cultivated, and with proven, good market value. Harnessing the local diversity of cash crop resources through research and development initiatives has, so far, not received much attention, despite the fact that the mountain areas are gene pools of valuable but unknown cash crop resources (Partap 1993). The ongoing research and development approach focusses on identifying distinct climates, comparing them to the agroecological requirements of known exotic cash crop varieties, and introducing these without making any efforts on better alternatives available indigenously. This, in a way, implies partial harnessing of the niche, at the expense of utilising its full potentials which requires more effort. The development of local resource-based cash crops will help break the monoculture of a few introduced crops and save the environment from pollution. Many of these local biological resources do not require chemical pesticides for protection. Harnessing seabuckthorn and other medicinal plants in the poor mountain areas of China could serve as good example of the future approach (Lu 1992).

The main problem with many, currently popular, cash crops is the heavy cost of crop management, including nutrient subsidies and plant protection. Monocultures of these crops, and their associated problems, have increased both the economic and ecological costs of growing these cash crops. There is the emerging problem of heavy use of pesticides and fertilisers for intensive farming of cash crops. This has led to reduced soil fertility, in some cases to levels where remunerative returns from cash crop farming are no longer possible because of escalating cultivation costs. Besides, overuse and misuse of pesticides by farmers with little knowledge of proper handling of these poisonous chemicals are also becoming causes for concern, with overtones of environmental pollution and adverse effects on the ecology. Apple scab and the subsequent rise in the cost of cultivation and crop management have adversely affected the profit margin of the farmers. Reports of similar increases in the cost of cultivation and crop management are increasing for hill vegetable farming (Singh 1990, Singh and Sikka 1989). Besides the cost of cultivation, the use of poisonous chemicals to control plant diseases has been adding to the environmental pollution of the area. The idea is not to totally oppose the use of pesticides and chemical fertilisers but to debate the strategies for a 100 per cent introduction, which will undermine the local biodiversity potential (Partap, 1993).

There are examples to show that promising genetic materials and local know how may be available in the mountain areas to improve cash crops for local suitability. However, one finds a lack of initiative on the part of research and development institutions in the context of exploring and using this local knowledge (Partap 1993). For example, in China, flowering quince is used by locals as apple root stock to induce dwarfing and early ripening. In the Swat Valley of Pakistan, through much trial and error, local people have gained experience in using incompatible species, such as the root stock of apple, to cope with soil-borne diseases. They use *Crataegus* as root stock by first grafting *Sorbus* onto it and then, later, grafting apple onto *Sorbus*, which is then compatible. These are only indications of a vast repository of indigenous knowledge, skills, and bioresources locally available, which, if fully harnessed, may help find a variety of cash crops as well as sustainable ways for their management.

Social Concerns of Agricultural Dynamism

At a glance, the transition from subsistence to market-oriented cash crop farming seems successful. It is true that the cash crop economy has increased the household incomes of small mountain farmers; and even modest households adopting cash crop farming command a purchasing power unheard of a decade ago. Farming communities, irrespective of ethnicity, socioeconomic status, and nationality, agree that, in many respects, this new found access has made their life considerably easier. Despite the inevitable insecurities brought about by this new mode of integration into a market economy, such as fluctuations in the market prices of inputs and produce, the credit trap, etc, the farm economy has no doubt improved.

However, this agricultural dynamism is not without repercussions. The displacement of traditional food crops by cash crops is, for example, one of the many aspects of this development. Growing cash crops means a decline in the cultivation of subsistence foodgrains. Since a greater proportion of foodgrains is purchased, changes in dietary habits and tastes which no longer favour traditional foods have become necessary. At a time when the global focus is directed to works maintaining agricultural diversity through all possible means, the old conventional approach to cash crop farming has not been very helpful in this respect. It has instead hastened the loss of valuable native crops and their genetic diversity.

Other issues include an increase in the agricultural workload and increasing dependence on and vulnerability to markets and so on. The increased levels of

cash crop productivity are now less a product of landholding quality and inputs than of intensive use of land and labour. Production and benefits are much tied to externalities. The new cash crops are leading to new dependencies on external markets for agricultural inputs, often leading to credit traps and the attendant harmful consequences. Market fluctuations, with respect to input and agricultural produce, are disadvantageous to the farmers who have little control over them.

Future Prospects for Cash Crop Farming

In the depressing scenario of deteriorating farming conditions, increasing poverty, and environmental degradation in the mountains, the emerging experience of successful cash crop farming among small farmers give hope for the sustenance and better living standards of the mountain people. The approach shows potential for improving the economic well-being of the mountain farming communities, bringing both better on-farm economic benefits and off-farm employment opportunities. Subject to the choice of the right type of cash crops, perennial tree crops/shrubs, or herbs, farmers in some pockets of the Hindu Kush-Himalayan region have also been able to harness their marginal land resources in more productive ways. The positive factor in promoting cash crop farming in mountain areas is that for small farmers in the mountains there are several constraints to enhancing their yield and production beyond a particular limit; cash crop farming gives them the best returns for their small, modest-scale production. A balance has to be struck between cultivation of traditional food crops and cash crops, especially in remote mountain areas where food self-sufficiency is often more important than food security. Inter-cropping, mixed farming, relay cropping, or multi-storey cropping are approaches which can be tested for different situations.

At present, poor support services, i.e. credit availability constraints, poor inputs, inadequate storage facilities, inadequate marketing and transportation infrastructures and information dissemination render it a haphazard and ineffective process of transformation. There is a pressing need for greater coordination between agricultural research institutes, extension services, and local farming communities, in order to identify needs and evaluate impacts. Small farmers in the mountain areas are scattered all over the terrain and thus would require location-specific information regarding cash crop choices and inputs. This can be done by actively involving research institutes and extension agencies in understanding the types of constraints and needs faced by the farmers. Nevertheless, successful as well as failed experiences of cash crop farming in the Hindu Kush-Himalayas have shown that building a strong

infrastructure, research and development, and institutional support are necessary for enhancing the pool of cash crops suited to specific niches, for better and sustainable crop management, post-harvest operations and marketing with advantage. A higher percentage of what the consumer pays for the mountain farmers' produce will have to reach the farmer; this has to be the goal of the cash crops' promotion strategy.

There have been instances in the past in which cash crop farming, in some areas of the Hindu Kush-Himalayas, was blamed for deforestation and environmental degradation. While there is an element of truth in this, it may also be a problem of perception; for example, the continuing poverty of the people could also have led to similar situations of environmental degradation, as is seen elsewhere. With remedial measures applied, in due course many of these examples go on to prove that it is a necessary initial phase of the development process and mistakes may be committed inadvertently. Environmental pollution, from the excessive use of chemical inputs for cash crop protection and growth, may attract increasing attention; to help solve problems of this nature, our research and development institutions will have to recognise their responsibility for providing alternative sustainable options.

There is much scope for and need to find ways of incorporating the traditional regenerative and resource-recycling agricultural practices of mountain farmers into cash crop farming. This would help halt or reverse the process of environmental pollution and land degradation and maintain the regenerative capacity of farmlands used for cash cropping. Such options will have to be more responsive to traditional knowledge, practices, and local resource bases (Partap and Jodha 1994). We have examples to show, such as Seabuckthorn harnessing in China, that cash crop farming could be resource protection and conservation oriented. Given the right perspective and resources, it is possible for research and development institutions to develop many such options for mountain farmers of every agroecological zone and mountain farming system. The need to centre cash crop farming in the mountains around the comparative advantage 'niche' implies that the cash crop farming development process must be seen more in the context of the environment than in the light of market forces.

There is a need to place more emphasis on the replication of successful experiences (Replicable Success Stories) in cash crop farming. This, in fact, could be the cheapest and quickest way of adopting a new crop technology or approach. However, the preconditions for the replication of a success story should be carefully examined before recommending its adoption. The whole process of replication needs careful designing on a case specific basis.

In conclusion, the crux of the matter is that cash crop farming holds the key to maintaining the viability of small and marginal farmers in mountain areas where further expansion of the landholding size is impossible. It also has potential for the sustainable management of marginal/fragile mountain lands. These should be dominant considerations in evaluating the significant contributions made possible by cash crop farming. The limited experiences of the past years have projected high-value cash crop farming as one of the potential options for the growth and development of societies living in fragile mountain areas. With the advancement of science and technology and institutional innovations, there is greater scope for finding solutions to many of the ills of cash crop farming experienced in the past.

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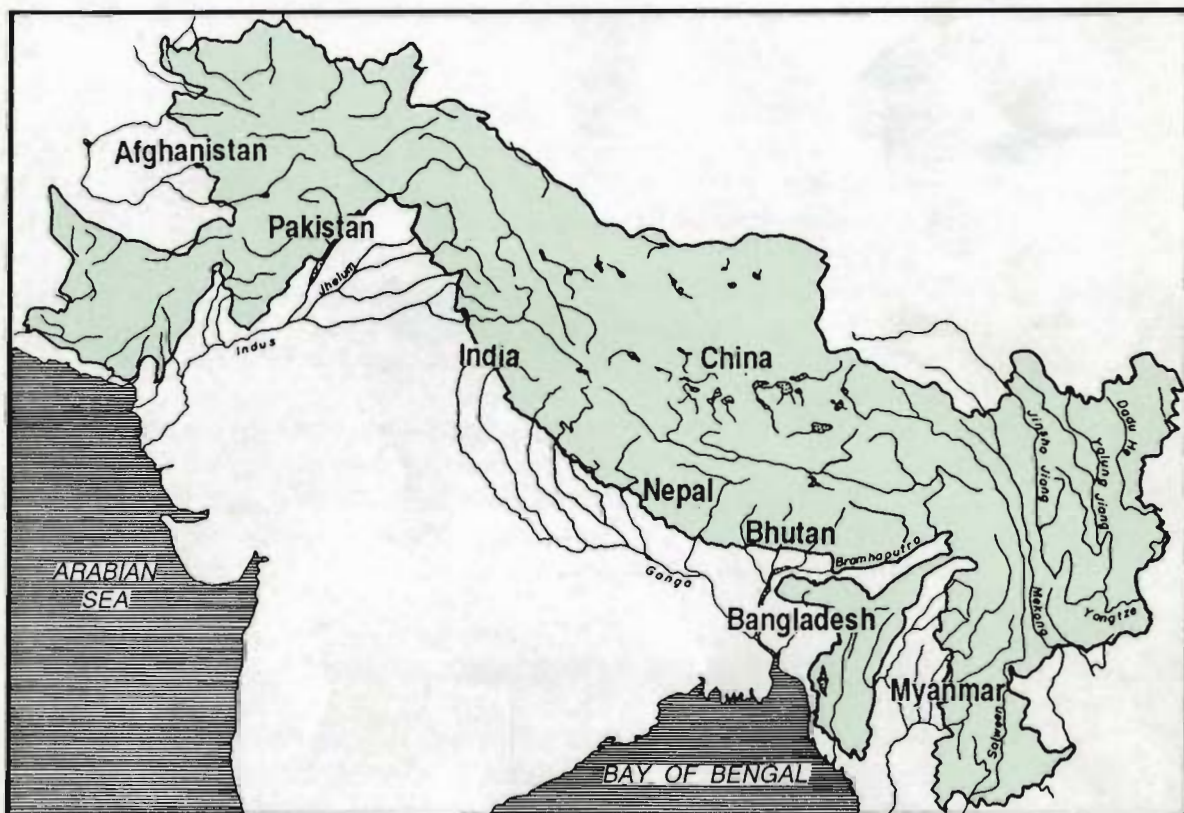
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