
Hill Agriculture: Challenges and Opportunities*

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I

PREFACE

The Farmers Commission, “Serving farmers and saving farming” points to rising acute agricultural distress in the rainfed areas of the country, which also includes hilly areas. It lists five basic cause factors that are central to the crisis; unfinished land reforms, water scarcity, technology fatigue-access-adequacy, institutional support and opportunities for marketing. While working for the National Commission on Farmers as a hill agriculture expert, the contributions on the hill agriculture perspective, gathered knowledge and information about the Himalayan farmers’ state of affairs, of global experiences etc., made by me in compiling the hill farmers section of the main report of the commission also form the basis of this paper.

The focus of this paper is on highlighting the challenges facing hill farmers and how they can be addressed. The paper first dwells on the scale and dimensions of the problems of hill farmers including the two most significant common concerns, increasing crop land scarcity and water scarcity to maintain agriculture on marginal lands. It explains various dimensions of the new thinking on marginal lands and implications. The next section, describes how similar problems were addressed by other nations successfully. To highlight the point that technological options are and have been available, the report cites examples of right technological hits of the Himalayan region. The last section analyses the opportunities to find solutions to the hill farmers’ distress.

Much of the farming development efforts made in the hills in the past were based on the poor understanding of the hill/mountain conditions, resources, environment and the socio-cultural setting of the people. The mainstream thinking on hill agriculture development was dominated by the biases against hill farming, marginal land based limitations, forest conservation as a priority, etc. Many of these perceptions may be unfounded.

This paper does not lay out any solutions, any technological options or any development strategy. It bares the problems and indicates possible pathways. To define an action plan one would need much deeper knowledge and understanding of

*Keynote paper presented at the 70th Annual Conference of the Indian Society of Agricultural Economics held at University of Jammu, Jammu on November 29 – December 1, 2010.

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the potentials and the crisis undercurrents across the hilly regions. The intention is not to provide a blue print for action but to stimulate a critical understanding of the tangled, multifarious processes.

II

STATE OF HILL FARMERS AND FARMING

Among the 34 million people that inhabit the Himalayan region, a large percentage is of the hill farming communities (mountains included). They sustain largely on subsistence farming which they practice on marginal rainfed and some irrigated farmlands occupying 15.8 per cent of the total area of the Himalayas, i.e., 53.8 million hectares. The rest of the Himalayan landscape includes rangelands, pastures, wastelands, the so called bush land- grazing areas and the forests; all these account for nearly 69 per cent of the Himalayan area. Another 15.2 per cent is under permanent snow cover and rocky mountains and serves as a perennial source of clean water to the hill people as well as to the rest of the nation. Agriculture is the primary sector of the economy contributing 45 per cent to the total regional income of the inhabitants. A great majority of the farming households in the Himalayan states have landholdings of less than 0.5 ha or small landholders with farms of 0.5 to 1.0 ha. While the average land holding in Himachal Pradesh is about 1.2 ha, it is even smaller (1.01 ha) in Uttaranchal (Table 1).

TABLE 1. THE HIMALAYAN REGION: DEMOGRAPHIC AND AGRICULTURE INDICATORS

State (1)	Area (sq. kms) (2)	Population (No.) (3)	Rural (numbers) (4)	Population density (per sq.kms) (5)	Area under forests (⁰⁰⁰ ha) (6)	Net cropped area (⁰⁰⁰ ha) (7)	Net cropped per cent of total area (8)	Cropping intensity (per cent) (9)	Average size of holdings per family (10)
North Western Hill region									
Himachal Pradesh	55673	6077900	5482319	109	1094	551	12.16	174	1.16
Jammu & Kashmir	222236	10143700	7627062	46	2747	733	16.27	147	0.76
Uttaranchal	53483	8489349	6310275	159	3342	788	14.91	164	1.01
Total	331392	24,710,949	19419656	75	7183	2072	14.47	160	0.97
North Eastern Hill region									
Arunachal Pradesh	83743	1097968	870087	13	5154	166	3.02	159	3.31
Assam	78438	26655528	23216288	339	1930	2701	34.41	152	1.17
Manipur	22327	2388634	1818224	107	602	140	6.33	142	1.22
Meghalaya	22429	2318822	1864711	103	938	240	10.71	111	1.33
Mizoram	21081	888573	447567	42	1599	91	4.31	100	1.29
Nagaland	16579	1988636	1635815	119	875	261	16.73	113	4.82
Sikkim	7096	540851	480981	76	257	95	13.38	127	1.65
Tripura	10486	3199203	2653453	305	606	277	26.41	152	0.60
Total	262179	39,078,215	32987126	149	11961	3971	17.09	145	1.92
India	3,287,240	1028,830,774	742706609	312.98	69024	141231	46.15	134	1.41

Source: NCOF Vol. II. Report, 2005.

In the north-eastern Indian Himalayas, shifting cultivation or “jhum” accounts for 85 per cent of the cultivated area and supports over 1.6 million people, largely tribal communities. The tribal families once food self-sufficient, are now barely able to produce enough food for the whole year. The swidden farming is a response to the ecological limitations of a humid tropical region and it exhibits a successful human adaptation mechanism to farming in the humid tropics. The swiddeners have developed an agroecosystem that is diverse and is able to respond successfully to the microclimatic diversities and climatic uncertainties.

TABLE 2. PRODUCTION TRENDS IN FOOD GRAINS, VEGETABLES AND FRUITS IN THE HIMALAYAN STATES

States (1)	Foodgrains		Fruits		Vegetables	
	1990-91 (2)	2003-04 (3)	1990-91 (4)	2003-04 (5)	1990-91 (6)	2003-04 (7)
N. Western Hill region						
Himachal Pradesh	80.27	75.81	14.42	20.29	3.55	3.15
Jammu and Kashmir	83.37	79.00	11.17	12.75	3.88	4.56
Uttaranchal	79.82	77.39	11.93	14.84	4.52	7.05
Regional average	81.07	77.40	12.49	15.87	4.01	5.06
N. Eastern Hill region						
Arunachal Pradesh	76.19	68.71	8.18	15.82	6.92	7.91
Assam	71.30	65.61	1.90	2.73	5.83	5.84
Manipur	81.00	55.74	9.40	8.10	5.90	34.75
Meghalaya	55.46	49.70	10.08	9.06	10.79	13.42
Mizoram	78.35	75.27	11.77	17.27	7.59	6.18
Nagaland	83.14	66.97	2.48	7.96	3.90	8.38
Sikkim	64.54	60.32	5.07	9.76	5.00	11.27
Tripura	65.54	62.24	10.11	5.44	6.82	7.31
Regional average	71.08	64.41	3.76	4.78	6.12	8.14
India	68.82	65.94	1.55	2.14	3.01	3.29

Source: NCOF, Vol.II.2005.

About 76 per cent of the gross cropped area of the entire Himalayan region is under staple food grain crops. The analysis shows that the production of food grains has not declined in the Himalayas as much as is often thought but foodgrain production may decline in the future because of the shift to cash crop farming. In the western Himalayan region, wheat is the main crop and rice, maize, millets, barley and buckwheat, pulses and oilseeds are also widely grown. However, Uttarakhand is unique in the sense that it has more area under millets and pulses. In addition, potatoes and a variety of off-season vegetables, spices, and fruits are also widely grown in the Himalayas. In the north-east, rice is the staple food crop occupying about 81 per cent of the cropland area under food crops. A diverse mixture of 8 to 10 crops is grown in a mixed farming system by the NE farmers. Crop survey assessments show that the area under paddy and maize is declining all over the Himalayas but the area under wheat remains unchanged. This reduction in area is largely because of a shift towards cash crops like fruits and vegetables.

Increasing Horticulture Trends in the Hills

The entire Himalayan range is favourable for growing a wide range of fruits, vegetables and other cash crops. Small areas with their own micro climatic conditions provide suitable sites for growing particular crops, such as apples, citrus fruits, walnuts, plums, peaches, bananas, mangoes and pineapples; vegetables such as tomatoes, radish, potatoes, cabbage, cauliflower, other cash crops like ginger, chillies, cardamom and saffron; and flowers such as orchids, gladioli, marigolds and chrysanthemums. The fruits and vegetables cover around 16 per cent of crop land. The proportion of farmlands under fruit crops is much higher in the western Himalayas (20 per cent), than in the central and eastern Himalayan states (5 per cent). The present trends towards rapid expansion of horticultural crops will have positive implications for improving the food and economic security of the hill farmers. With diversification of farming in the hills, many second generation issues of unsustainability are also emerging. In the landmark study by Partap and Partap (1996) a serious problem of pollination failure was reported, making a dent on the productivity of apple. The second generation problems are also of ecological and social nature, such as equity, gender and ethnicity, etc.

Livestock Integral to Hill Agriculture

Indian Himalayas support about 50 million domestic animals (1.6 animal/ ha); cattle (47.5 per cent), goats (15.8 per cent), buffaloes (12.3 per cent) and sheep (10.4 per cent). Livestock produce comprises dairy products, wool and manure. Certainly livestock is higher in the Himalayas than in the plains but it also remains a fact that the region has a niche for livestock based livelihoods that one finds in the large area under rangelands and highland pastures. A large proportion of livestock species is raised under mixed cropping systems. The land holdings are small and livestock supplement the family income. Animal dung and bedding material provide manure and compost for the crops. Until the past decade, almost the entire draught energy requirement of hill agriculture was met from bullocks. Over the past one decade, the number of cattle has started declining while the buffalo population is increasing. Similarly the number of sheep is declining but the number of goats is increasing. When herd size is reduced, there has also been a simultaneous shift from local breeds to hybrid cattle and other animals which induced widespread stall feeding trends.

The Constraints of Hill Agriculture

Hill agriculture has some inherent constraints of remoteness and inaccessibility, marginality and fragility in terms of moisture stress and the poor soil conditions and a short growing season. Added to these are socio-economic constraints such as small holdings, poor productivity, poor production management, labour shortages, poor post-production management, poor marketing and networks (lack of market

development) and lack of entrepreneurship. All these have led to under-utilisation of resource bases in the hills and limited generation of surpluses.

Nevertheless, the Himalayan areas also have specific advantages that can be harnessed to good effect, in particular the wide diversity and the presence of niches particularly suited to certain crops, e.g., the apples in Himachal and saffron in the Soppore valley of Kashmir, pashmina goats and yak in the highlands of Ladakh or mithun in Arunachal Pradesh. It offers hope to develop these comparative advantages, promote investment in such niche areas as part of the efforts to improve farm economy in sustainable ways. All across the Himalayas, the declining size of landholdings has seen a virtual invasion of farming communities on the non-farm CPR land—waste land, rangeland, forest areas, etc. for conversion into cropland. Many areas are witnessing, increasing out migration. It has created a unique situation in which a sizeable percentage of women are today heading farming households and the economy of these households is at best known as money order economy.

With few exceptions, the constraints on improving horticulture crops in the Himalayas include poor orchard management practices, quality planting material, seeds and other inputs, little access to extension services and marketing. Across the Himalayan region, farmers face problems in accessing market information, post-harvest processing and value adding skills. Because of a lack of regular markets and reliable marketing, hills farmers in many areas are finding it too risky to diversify into more lucrative high value crops. As shortage of fodder and feed is rampant in the hills, farmers complain, “livestock fodder problem is more acute than the human food problem in the hills”. The rangelands and grasslands are operating at one-fourth of their productive potential. Most of the fodder and grazing areas have been infested by non-palatable invasive species, such as lantana, eupatorium and congress grass. As an estimate, there may be up to 70 per cent shortage of fodder faced by the Himalayan farmers.

Crop Land Scarcity and Water Scarcity

Livelihoods of majority of the population in the Himalayan region revolve around agriculture. Here land is the nucleus of all socio-economic activities. For majority of the small and marginal farmers, their wealth and poverty is associated with the ownership of the size of land holdings (Partap 1995, 1999). For a large number of small and marginal farmers of the Himalayan region, shrinking crop land holdings is a key concern for managing food and livelihoods (Pokhriyal and Bist, 1988; Partap, 1998a). Rural development efforts across the Himalayan region face a serious challenge of finding a solution to this problem (Partap, 1998b). The per capita available cropland in hilly areas across the Indian Himalayan states is already too little to sustain livelihoods. The consequences of this situation to sustaining livelihoods and management of land resources are serious indeed. The 11 per cent cropland available to support livelihoods of disproportionately large number of mountain farmers is further divided into a range of flat and sloping land types.

While 37 per cent of the cropland is sloping land of various degrees and the Himalayan farmers are even cropping sloping lands beyond 25 and 30 degrees (Partap, 1999). Down in the valleys, new human settlements, urbanisation, industrialisation and government infrastructure development activities, all are competing for converting the valley crop land into non farm use.

The implications of cropland scarcity in the hills are manifold, in the form of indicators of the unsustainability of hill agriculture with respect to land resources, production and livelihoods. The unsustainability indicators are in fact hidden responses of the farmers to a lack of access to croplands of adequate size and quality. The state of croplands in the hill region and its impact on the food insecurity and continuing poverty paint a grim picture for sustainable hill agriculture. The key issues that emerge are the shrinking size of land holdings (Table 1), erosion from sloping farmlands, a decline in soil fertility and above all a widening cycle of inadequate food production-food insecurity-poverty-resource degradation and increasing unemployment and frustration.

Water scarcity for drinking and irrigation in the hills due to increasing climate change impacts,....

It highlights the fact that “unless urgent solutions are found for cropland scarcity and water scarcity so as to make farming based livelihoods sustainable; agriculture as a source of sustenance for the hill farmers will continue to loose its significance”.

Agricultural Diversification: Emerging Issues

Though some hill states have been successful in agricultural diversification through fruit and vegetable farming which helped to improve the livelihoods of small and marginal farmers, diversification is already causing the second generation problems and the challenge of sustaining and widening the benefits of hill agricultural diversification is beset with a range of new problems such as,

- Large proportion of marginal farmers are yet to benefit from agricultural diversification due to scarcity of crop land or irrigation water
- Second generation problem of cash crops farming
- New generation of farmers: the educated unemployed youth exploring entrepreneurship opportunities. Millions of educated unemployed youth across the Himalayan states, mostly from the farming families are waiting for the jobs. Even though many of these educated unemployed youth have acquired the traditional knowledge of farming from their families, they no longer find it remunerative to get engaged in it; yet they need to be equipped with the necessary knowledge and skill in farming, entrepreneurship and agribusiness.
- Unexplored comparative advantages of hill agriculture.
- Biological degradation of support lands – the waste lands.
- Climate change impact on hill agriculture.
- Weak mountain agricultural research and extension support services.

TABLE 3. UNDERSTANDING UNSUSTAINABILITY OF HILL AGRICULTURE THROUGH INDICATORS

Indicators Reflecting Problems Relating to Resource Base/ Production Flow and Resource Management (1)	Range of changes (2)
1. Soil erosion rates on sloping lands	+20 to 30 per cent
2. Abandonment of Agricultural Land due to decline in soil fertility	+3 to 11 per cent
3. Appearance of Stones / Rocks on Cultivated Land	+130 to 100 per cent
4. Size of Livestock Holding per Family (LSU)	-20 to 55 per cent
5. Area of Farmland per Household	-30 to 10 per cent
Forest Area	-15 to 85 per cent
6. Pasture/ Grazing Area	-25 to 90 per cent
7. Good Vegetative Cover on Common Property Land	-25 to 30 per cent
8. Fragmentation of Household Farmland (in number of parcels)	+20 to 30 per cent
9. Size of Land Parcels of Families	-20 to 30 per cent
10. Distance between Farmland Parcel and Home	+25 to 60 per cent
11. Food grain Production and Self- Sufficiency	-30 to 60 per cent
12. Permanent Out migration of Families	None to 5 per cent
13. Seasonal Migration	High to High
14. Conversion of Irrigated Land into dry land farming due to water scarcity	+7 to 15 per cent
15. Average Crop Yields on Sloping Lands	
Maize and Wheat	-9 to 15 per cent
Millets	-10 to 72 per cent
16. New Land Under Cultivation	+5 to 15 per cent
17. Human Population	+60 to 65 per cent
18. Application of Compost (organic manure)	-25 to 35 per cent
19. Labour Demand for Fallow Productivity	+35 to 40 per cent
20. Forestry Farming Linkages	Weak to Weak
21. Food grain Purchases from Shops	+30 to 50 per cent
22. External Inputs' needs for Crop Production	High to Medium
23. Fuel wood Fodder Scarcity in terms of time spent in collection	+45 to 200 per cent
24. Fodder Supply from	
Common Land	-60 to 85 per cent
Private Land	+130 to 150 per cent
25. Emphasis on Monocropping	High to High
26. Steep Slope Cultivation (above 30 %)	+10 to 15 per cent
27. Weed and Crop Herbaceous Products' used as fuel wood	+200 to 230 per cent
28. Conversion of Marginal Land into Cultivation	+15 to 40 per cent
29. Fallow Periods	From 6 to 3 months

Source: Shrestha, 1992.

Note: A positive sign (+) means increase and negative sign (-) means decline/decrease.

Timeframe of changes: 1954-1991 = 37 Years.

Inappropriateness of Soil Erosion and Degradation Control Dominated Approaches

Hill agriculture development in our country is generally based on the perception of land degradation. In this perception, the vicious cycle of poverty-land degradation-food insecurity-poverty, puts the blame on hill farmers for forest denudation and crop land degradation problems. Interestingly, the studies commissioned by the World Bank and Asian Development Bank predicted dooms day for the Himalayan farmers of Nepal by the end of 2000. The studies argued that the Himalayan farmers are causing large scale soil erosion and land degradation and their farming cultures are the root cause of large scale forest denudation, land degradation, siltation of dams and

rivers. This thinking linked hill farmers livelihoods to all the evil processes in the hills.

In contrast to this, in a new line of thinking, the world over unrest in the mountains, has been attributed to the above mentioned perception-led policies and interventions, which denied or restricted the rights and access of hill people to their livelihood resources, be it the farmers of north-east India, Uttarakhand, the hill farmers in northern Thailand, Myanmar, Bangladesh or the Andean Indians of Latin America etc. Unloading the soil erosion and degradation loaded mind sets of researchers and development thinkers would be necessary to revisit the whole issue in the light of new knowledge and information. The new mantra is –“Given the opportunity and supportive conditions, hill people are masters in using natural resources prudently.” Governments only need to create an enabling environment, in place of a whole range of restrictive regimes which have alienated hill farmers from their own environment - making them refugees in their own surroundings”.

A Knowledge Gap about Geographic Size of Hilly Areas

The geographic areas of hill states have been calculated long ago using available means and these tools had the limitation of not being able to calculate the area under the verticality of hills and mountains. This means that the official geographic area of all hill states is as if they are plain and it does not include the area created due to the verticality factor. The new tools, i.e., GIS based digital elevation models and other tools now help us calculate the area correctly. For example, the official area of Himachal is 55,000 sq km but when new tools were used, the actual area turned out to be 88,000 sq km. A difference of 33,000 sq km is huge indeed. This extra land is not crop land because crop land is measured and recorded in the revenue records. Then it may be the forest land or any other non crop land. An increase in non agricultural land of a state should facilitate major policy decisions about the economic accounting of the ecosystem services rendered by hill farmers, like the Swiss system.

III

LEARNING FROM GLOBAL EXPERIENCES TO DEVELOP A NEW THINKING ON HILL AGRICULTURE

The Mountain People and Policies in Japan

Japan has over 68 per cent hilly area with a 30 per cent cropland of the nation. After decades of neglect and bias against the hills, agriculture and people inhabiting the hills faced an uncertain future. Hill agriculture in Japan faced difficulties of a social nature. The alarming rate of households were abandoning hill farmland and over 3.8 per cent of the nation’s farming area was abandoned by 1998. As a result,

hill farming communities of Japan faced the problem of extinction due to decrease in agriculture and an increase in forest area, depopulation and the aging of residents (Nakagawa, 1998; Sugaya, 1998). As industrial growth offered ample job opportunities for the younger generation of hill farmers, they seemed no longer interested to continue farming their family land. Japan has a paradoxical situation, where 91 per cent of its agricultural land and 40 per cent of its agricultural resources actually exist in the hills.

The factors responsible for the declining hill farming in Japan include a decline in the number of farmers and their age, concerns over future prospects of liberalised agriculture trade, not enough job opportunities in the hills, delay in social capital infrastructure development, small land parcels making mechanisation difficult, intricate topography and small size of land holdings, lack of adequate access roads limiting use of farm machines, higher costs of land grading, irrigation etc. (Sugaya, 1998). The implications of the rising rate of abandoned farming includes an increasing national food insecurity, a loss of hill crops; and loss of indigenous knowledge of hill farming threatening Japan's long term national food security interests. The strategic shift in Japan in favour of hill farmers is an acknowledgement by its policy makers that tomorrow Japan may have a crisis of a different kind, scarcity of hill farmers and of not enough people knowing how to undertake hill farming?

Having realised the gravity of the situation, Japan made a strategic turnaround in its hill agriculture policy. It reframed its policy which *considered declining hill agriculture as a national crisis, and made* serious efforts to reverse the trend. The Depopulated Areas Emergency Act and the Mountain Villages Development Act were enacted to conserve hill agriculture rather than forests. To support niche based high value farming and income generating options for the hill farming communities R&D support focused on; vegetable farming and floriculture with special highland products; animal husbandry on grasslands; labour intensive organic farming; developing forestry; micro enterprises development – food processing, etc., adding value to the local farm produce; changing tourism development approach to build stronger tourism- farming linkages “farming for tourism”. The Shikoku National Agricultural Research Station was mandated to focus its research on “slope land agriculture.” The thrust was on reversing the trend of declining number of mountain farmers and reducing the area of hill agriculture.

What has happened in Japan, carry a very important message for the future of hill agriculture in India. Looking deep inside the Uttarakhand hills, one finds that similar conditions may be developing in several areas of the Indian Himalayas and that hill agriculture in India may face a similar situation sooner than later.

Innovative Hill Agriculture Policies of South Korea

Korea has a 66 per cent hilly area with 33 per cent of farmland of the nation. Korea has been promoting the policy of “*Agricultural Promotion Area (APA)*”,

which favoured only plain areas for an agricultural investment priority. For this reason, hill agriculture falling under the “*Less Favoured Areas (LFA)*” was neglected for investment. As a result, Korean farmers living in the hills found it harder to survive under poor production conditions. The quality of life in the hills was certainly lower than in the cities, encouraging the younger generation of farming families to leave farming and the farmland for jobs and better livelihoods in the cities. The hardship of upland farmers was further compounded by the shortage of farm labour because of job-induced migration of young upland folk to urban areas. It was a key factor that contributed to accelerated abandonment of agriculture and farmland in the Korean uplands. As an example, in 1993 alone over 66,500 hectares of cropland was abandoned, which was 3.2 per cent of the country’s total cropland (Gim, 1998). By this rate nearly half a million hectares of cropland in the hills would have become abandoned by the year 2000.

Korea made a shift in its policies, considering that even if the hills are less productive, continuing farming on these lands may yield a higher positive externality to society than the favourable production condition areas. Higher the positive externality of these marginal areas, higher will be the price and percentage of tax payers “*Willingness To Pay (WTP)*” so as to maintain farming in the marginal upland areas (Gim, 1998). The trend has encouraged the government to consider reshaping of the policy of the agricultural promotion zone for investment and now it has included hill areas also in it. Thus, Korea has adopted a unique tax policy for city dwellers called “*Willingness to Pay*” and uses the revenue generated for improving farming and livelihoods in the hills. The other relevant strategy was “*the marginal land improvement programme (MALIP)*” for the hilly and mountain areas. It was two-dimensional. One, it was to improve the use of marginal upland as productive land; two, it was to promote the use of marginal upland for other farm and non-farm purposes such as rural resorts, livestock farming, fruit farming and industrial development (Gim, 1998). Further, a scheme for compensating mountain farmers through direct cash payment to continue farming their farmlands was also introduced. It had two key objectives, increase food supply and preserve traditional farming areas on the hill landscapes. These strategic shifts paid in reversing the unsustainability trends.

The lessons of the Korean experience are summed up by Gim (1998) as follows, “When the agricultural policies and measures consider only economic values, they are not sustainable and future generations may suffer access to resource base. Therefore, the policies favouring direct and indirect support to maintain hill farming, are necessitated by both ecological and economic considerations.”

Guided Mountain Farming in Switzerland

Mountain farmers of Switzerland are considered by law as undertaking ecological and economic services (tourism attraction) to the nation through maintaining their homesteads and farming in the mountains. Land use laws restrict farmers from

carrying out crop cultivation. They can only have cows and the sale of milk per family is also highly regulated, encouraging household name in cheese. An important point to note here is that the hill farmers are paid adequate compensation due to their direct ecological services and indirect contribution to the tourism economy of the nation. This compensation is paid to them from the national revenue earned from tourism. Similar conditions prevail in the Kashmir valley, Ladakh, Mountain valleys in Himachal Pradesh and elsewhere in the Himalayas.

IV

LEARNING FROM HILL AGRICULTURE SUCCESS STORIES FROM INDIAN HIMALAYAS

Improved Livelihoods through Fruit Farming

This success story of several districts of Himachal Pradesh, is illustrative of promoting fruit farming on the marginal farm lands in the hills. The fruit based production system helped alleviate the poverty of many hill farmers of Himachal. The quality of life has improved dramatically. Over 86 per cent of the population is now literate and there is almost 100 per cent literacy below 14 years. From the view point of the employment and income generation, fruit and vegetable farming are high quality options for hill farmers. The high quality of production options is also evident from their backward and forward linkages generated by them. Fruit crops farming in Himachal has helped address the following two major livelihood concerns of the hill people;

- It promoted the productive use and management of marginal land resources.
- It helped convert non-viable subsistent farming into viable farming through harnessing of appropriate niche potentials of marginal mountain lands.

Forest Floor Farming of Cardamom in the Forests of Sikkim

The subsistence dry land farming on the sloping crop lands of north Sikkim should present the poverty-cum-resource degradation scenario for the farmers. However, the ethnic mountain farming communities of Sikkim had chosen a wild high value spice—cardamom for barter and cash income source. The farmers started farming it under the forest floor like any perennial crop. For decades now cardamom, is their high value cash crop grown under the shade of natural forests as well as under alder afforestation.

Almost 75 per cent farmers of north Sikkim have replaced the foodgrain agriculture on their farmlands with cardamom and alder tree plantations. Cardamom-alder forestry plantation provided permanent green cover to thousands of hectares, i.e., 23 per cent of farmland. The contribution of cardamom farming to sustain livelihoods ranges between 40-88 per cent. Four key factors which make cardamom farming on marginal sloping lands useful are;

- It is ecologically adapted to farming on sloping lands and forestry system.
- Plants maintain permanent green cover on the forest floor.
- Cardamom farming ensures ecological stability to fragile mountain slopes by requiring farmers to maintain a good forest cover of nitrogen fixing alder trees.
- Cardamom is farmer domesticated, low volume-high value cash crop.
- It generates employment for a minimum of 80-100 days per hectare.
- Globally almost 90 per cent of cardamom is produced in Sikkim and its neighbouring valleys of Nepal and Bhutan alone, therefore, their region is the niche of cardamom and enjoys a comparative advantage in marketing.

Developing the Concept of Economic Forestry: A Success Story of the Chinese Hilly Areas

Seabuckthorn provides a breakthrough in combining strategic desert conservation with the local economic needs of the farmers in the hilly arid regions of China. Seabuckthorn plantations and R &D in the post harvest processing of wild fruit into a variety of valuable products including medicines, have made a marvellous impact on both households and the regional economy. China has now well managed seabuckthorn forests covering millions of hectares. By the end of 2004, the seabuckthorn agroenterprise was a multi million agro enterprise in China. The seabuckthorn success story is one of the outstanding examples to explain how development approaches for hills can combine horticulture and forestry to promote an economically and ecologically productive hill farm economy. A forest of wild seabuckthorn bushes represents the characteristics of a good forest on the sloping lands and river valleys as well as economically productive features of a fruit orchard. Local farmers of the areas have strong economic interests in maintaining the seabuckthorn (*Hyppophae L*) forests and government institutions have long term strategic (ecological) interests in promoting it. In India, LEH BERRY BRAND is yet to help make a good success story out of Seabuckthorn for the Himalayan farmers of Ladakh, Himachal, Sikkim and Arunachal Pradesh.

Drawing Inspiration from the Success Stories

Fruit farming on the marginal farmland in Himachal Pradesh, cardamom plantations in the forests as well as conversion of sloping farmlands into forests for planting cardamom and the afforestation of barren land with seabuckthorn in China; in all the three cases the technological options reflect a better understanding of the niche perspective—the real niches consider the use of local biodiversity as a priority.

In these examples, marginal land was adopted as a given condition and agricultural development options were searched accordingly. The commonalities among these examples are the productive use of marginal farmlands and support land, soil and water management and harnessing of specific niches. The three examples

convey a message that marginal lands are not constraints to productivity if appropriate technological choices are made. Marginal lands have specific niches (comparative advantages). A proper understanding of the niches can provide clues to the potentials of marginal lands under given agro ecological environment.

The three production systems use perennial plantations of different types with equal advantage- be it modern varieties of apples or a farmer domesticated perennial spice cardamom or a wild thorny shrub- seabuckthorn. All the three production systems were aimed at combining economic sustainability with ecological stability of the landscape and local environment. Cardamom farming highlights two points, one is that local biodiversity can be a good source of niche based crops for hilly marginal lands. The perspective behind the marginal land hill crops is that these are the plant resources adapted to the prevailing edaphic and climatic conditions of marginal lands. These may not be the crops coming from the experimental stations of research institutions but local plants whose economic potentials have been determined by the market or industry. The Seabuckthorn story provides insights to the technological scopes for combining soil and water conservation efforts on marginal and fragile land with food security and poverty alleviation.

The seabuckthorn case is a unique example, which explains that forestry systems can be designed in such a way that while serving the purpose of good forests they can also provide the benefits of horticulture plantation to the local people. Seabuckthorn initiative also explains how forests can be made to serve as fruit trees farming in terms of offering livelihood opportunities.

The experiences described above add a new dimension to the thinking process about linking marginal land management to improving livelihoods. The trends unfolded by these case examples define a role for the biodiversity/agro biodiversity in enhancing use value of marginal land for sustainable hill agriculture development strategies. The core message of the three success stories is that if the development thinking changes from “considering marginal hill lands as constraints to livelihood opportunities and poverty alleviation to that of lands of opportunities,” it brings both ecological and economic gains to the hill societies and the nation.

v

RETHINKING NEEDED IN HILL AGRICULTURE DEVELOPMENT

*Rethinking about Reshaping Hill Agriculture Development
Strategies to Add Hill Perspective*

For sustaining the livelihoods of hill farmers on agriculture, it is necessary that hill agriculture is understood in the right perspective. Precisely for these reasons, hill/mountain agriculture is defined as a livelihood system which includes all land based activities on which farmers are dependent to make a living, such as cropping, horticulture, livestock, rangelands and pastures, forests etc. The diagrammatic

presentation of these components along with the imperatives of hill development, better known as mountain/hill specificities are given in Figure 1. The diagram indicates how development interventions should be seen as addressing the needs of the farmers as influenced by the hill specificities. The hill/mountain perspective framework developed by experts at the International Centre for Integrated Mountain Development (Jodha, 1990) identifies these six mountain/hill specificities, viz., inaccessibility, fragility, marginality, diversity, niche and adaptation mechanisms. It is argued that each of these specificities has three dimensions, physical, biological and socio-economic which determine the suitability or unsuitability of any intervention.

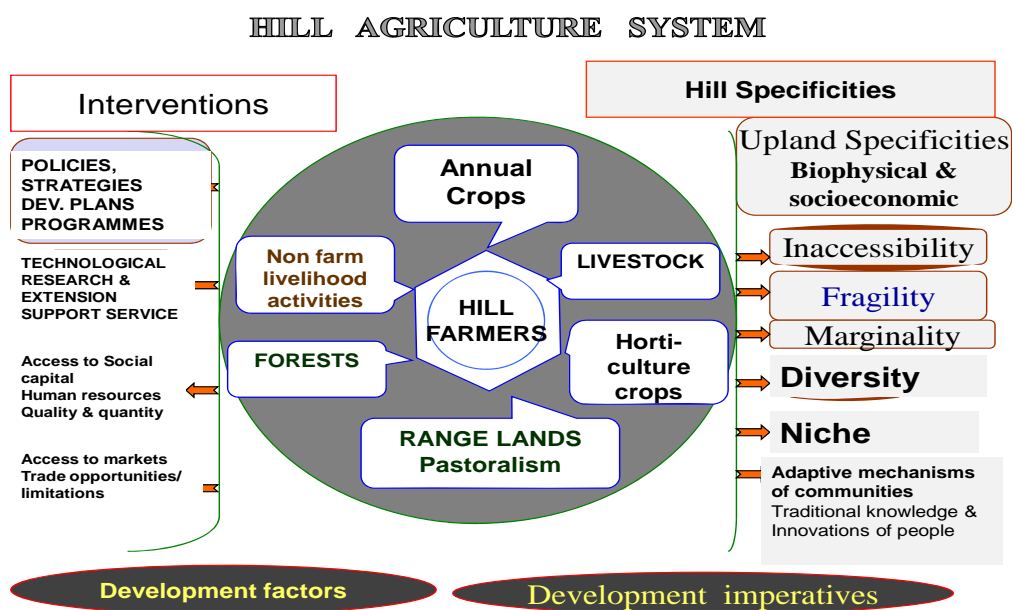


Figure 1. A Perspective of Hill Agriculture Components, Development Imperatives and Development Factors/ Interventions

Source: Author.

The development of sustainable hill agriculture systems requires that development planning processes follow certain guiding principles, i.e., “*Approaches to hill/ mountain agriculture development will be sustainable if they are designed to mimic the land cover and other control mechanisms that occur naturally in a given mountain ecosystem*”. The guiding principles emerging from the above overarching statement are listed below.

- Hills are less suited for ‘uni-dimensional land use’ but more suited to multiple strategies that consider unique characteristics of smaller sites within

the whole landscape; ensuring a balanced relationship between people and land resources. Productivity is not only based on the biophysical characteristics of hill lands, but also depends on the socio-economic parameters of the hill environment. Technologies may be known but the other necessary incentives, institutions or inputs may be missing.

- Identifying and harnessing location specific niches and diversity of land use opportunities.

Rethinking on Degraded Land and Marginal Land Perspective

Marginality of hilly areas is not a static concept, it is a dynamic process. Therefore, while dealing with the marginality of hill areas, it has to be assessed in terms of specific types of land use. A rainfed sloping farmland that is marginal for a crop requiring continuous irrigation and moisture for a whole growing period (e.g., rice) could be highly productive for perennial fruit crops which need less moisture and can even tolerate periods of drought in between rainfall periods. Also what is marginal land for cropping because of the terrain or short growing period; may support a productive and sustainable livestock production system, herbal medicines farming in the pastures and fruit farming.

Rethinking on Institutional Biases and Neglect

Due to the widely held view that cropping is unsustainable beyond the 15 per cent slope, agriculture R&D ignores focus on such areas. Sloping landscapes are largely managed to protect watersheds under strict regulations which set aside forests on lands with slopes on 18-30 per cent or forbid annual cropping on these lands. That means the agricultural research system continues to ignore finding solutions to farming sloping lands sustainably despite the fact that people have been cultivating these areas and need technological assistance the most. Unfortunately, “policies and institutions nurtured misconceptions about the role of forests to the extent that they blocked opportunities for adopting better alternatives”. The implications were far reaching for improving the livelihoods of the people and sustainable management of these lands. For several decades now, our hill development philosophy has been led by the belief that controlling potential negative downstream effects require the maintenance of forest cover, have supported the hill development policies focusing on forest cover through regulation or the exclusion of local users, across a wide range of ecological and socio-economic regimes. These perceptions form a part of the root cause of distress of the hill farmers witnessed today.

There is yet another area where conventional R&D thinking and approaches have not yielded the desired results but are rather proving to be counter productive; it is the promotion of a wider use of chemical fertilisers and pesticides in the name of

increasing productivity and production for the sake of food security. In contrast to this, the shift of the hill farmers towards organic farming, particularly since 2001 in several Himalayan states, is making an impressive impact. In a nationwide survey of organic farmers, Partap and Vaidya (2009) found that there are several factors which are encouraging farmers to convert from inorganic farming to organic farming, namely; an improvement in soil quality and fertility, reduced dependence on external sources, productivity and high input costs, health hazards of pesticides and premium prices. The cost benefit analysis indicated favourable economics of organic farming to the small farmers of India. Farmers reported that organic farming is making a positive impact on the environment, human and animal health, agrobiodiversity, moisture conservation and farm incomes.

Rethinking on Strengthening the Role of Hill Women

Hill women are the most important food producers. It is important to recognise that the knowledge and experience of generations permit women to have a great flexibility in cropping practices. For women, trees and forests are multifunctional whereas men tend to concentrate on their commercial potential for timber and other goods. Mountain women have traditionally been the invisible work force, the less acknowledged backbone of the family economy. Even though, women fulfill a great number of essential tasks, they have limited access to and control over income, credit, land, education, training and information. It is only recently that the participation of women in development programmes in hilly areas is being considered necessary. The extension approaches and tools may still be gender biased and therefore much needs to be done to encourage cooperation and partnership of women in hill development. The recent successful experiences with mahila mandals, self-help groups (SHGs) in several hilly states is a reminder of the potentials of partnership of women in the development of hilly areas.

VI

CONCLUSIONS

The sustainability prospects for mountain agriculture remain bleak unless the main stream perceptions about the problems are not changed. The hill perspective based development strategies are essential for formulating farmer responsive plans, giving due consideration to the nature of marginality, fragility, diversity and niches of each area. It will not only help ameliorate the impact of the marginalisation of hill communities but also help in achieving social equity by building on the comparative advantages of key land resources.

While development thinking in the hills view marginal sloping lands as a constraint, the hill farmers' marginal lands are a given condition and diversified livelihood options have been evolved to capture the niches and comparative

advantages of available natural resources, namely, mixed farming, nomadism, swidden farming, etc. The significant trend witnessed by the Himalayan states in recent times is the change in demographic patterns (growing younger population and increased male out migration in search of cash income opportunities in the cities. This has led to a shortage of men in the labour force and increasing farming related workload for women.

Unemployment is widespread across the Himalayan states — a large force of educated unemployed rural youth from farming families are waiting for opportunities. It requires strategies for job led growth and for a paradigm shift in thinking from the mere productivity enhancement of crops to job led hill agricultural growth strategies. Undesirable land use changes and natural resource degradation in many hill areas are a result of long political turmoil in these areas. Peace and political stability appears as a precondition for the rational and equitable use of the resources.

While the intensification of agriculture is continuing with the expansion of cropped lands, the marginal farmers have limited access to agricultural technologies and inputs and this in turn is contributing to the decreasing productivity of hill farms. Breakdown of isolation and opening up of hills to the wider market economy have both positive and negative impacts on the livelihoods of small hill farmers. However, because of the strong highland-lowland linkages, these areas cannot be looked at in isolation. An important challenge is to identify the different linkages and develop the comparative advantages that agriculture in these areas offers.

Even though hill production systems are becoming increasingly unsustainable both economically and ecologically, yet the policy makers have not been sufficiently sensitive to the specific upland conditions and constraints faced by the hill farmers. In this context, hill peoples' resource rights are being fragmented and undermined through administrative policies, national environmental legislations and trade agreements. Unclear land rights and inappropriate land use policies have often led to land use patterns that have endangered biodiversity and damaged environment. For people living in poverty; the environment, the commons and its natural resources involve beliefs, faith, wealth and knowledge systems which are close to their lives. The production niches and biodiversity have the potential to convert marginal uplands into productive production systems. There are areas in the hills that in fact have significant potentials for research-driven productivity increases, and that the returns on investment in these areas may even surpass the favoured areas.

The increased attention of hill agriculture research to address water—land—poverty linkages, which goes beyond soil conservation projects, is necessary. Water insecurity appears to be a main poverty feature in the uplands where sloping lands dominate. It will be important to have a better understanding of the supply and demand of water at a local level how to tide over water scarcity through managing excess availability. Water excess is as much a cause factor of degradation, as its scarcity.

The diversification of hill agriculture can provide better choices and quality options for sustaining the livelihoods of hill farmers. But what is necessary in this process is to develop a clear understanding of the ecologically and economically sustainable farming options. There have been examples of the successful infusion of environmental and development goals, as shown by the success stories. Changes are needed in law where it denies access to and the use of sloping land resources that are basic to the livelihoods of local people. Shifting cultivators and agro-pastoral communities need that attention more than any one else.

For developing the right approaches to hill areas development, there is also much to learn from the experiences of other nations. To benefit from the experiences of other countries, initiatives focusing on inter country transfer of knowledge and information about successful technological and institutional innovations is needed. For the hill farmers of India, there are more commonalities with hill farmers of China, Korea, Taiwan and Japan than with the west. India needs to look EAST and not WEST for a better understanding of agriculture issues and for the right strategies to harness the opportunities.

Keeping in view the unique and special agro-ecological and socio-economic setting and recognising that the Green Revolution did not succeed in climbing the Himalayan heights. The National Policy on Farmers outlined by the National Commission on Farmers (NCOF, 2006) has strongly recommended that the National Policy on Agriculture should have a special parallel window on hill agriculture so that it can commensurate strategies for hill agriculture research, technology and marketing could be established. It recommended strengthening the interdependency and synergy between all the sectors of agriculture, viz., crops, horticulture, livestock, fisheries, forestry and the associated natural resources.

Investments will also be required in research technology and development to create a basket of choices of suitable production systems capturing every niche. An enabling policy environment is essential in order to recognise and encourage people-based initiatives in different areas. Thus, to capture commonalities and comparative advantages of hill farming and to harness the synergy of the National Policy on Farmers (NCOF, 2006) advocates establishing of a North Western Himalayan Development Council on the lines of the NEH Council.

REFERENCES

- Asian Productivity Organization (1998), "*Perspectives on Sustainable Farming in Upland Areas*," Tokyo, Japan.
- Banskota, M. (1992), "*Dimensions of Unsustainability in Nepal: Economic Policies for Development*," Asian Development Bank, Manila and International Centre for Integrated Mountain Development (ICIMOD), Kathmandu.
- Banskota, M., T.S. Papola and J. Richter (Eds.) (2000), *Growth, Poverty Alleviation and Sustainable Resource Management in the Mountain Areas of South Asia*, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, and Food and Agriculture Development Centre (ZEL), Feldafing, Munich.

- Chang, S.F. (1998), "Republic of China Taiwan - A Country Report", in Proceedings of the Workshop on Perspectives on Sustainable Farming Systems in Upland Areas, Asian Productivity Organization, Tokyo, Japan.
- Dev, M.S. (1991), *Indicators of Agricultural Unsustainability in the Indian Himalayas: A Survey*, MFS Discussion Paper No. 37, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu.
- Gim, U.H. (1998), "Republic of Korea- A Country Report," in Proceedings of the Workshop on Perspectives on Sustainable Farming Systems in Upland Areas, Asian Productivity Organization, (Tokyo), Japan.
- Jodha, N.S. (1990), *Mountain Perspective Framework*. Discussion Paper, MFS 1/1990, www.icimod.org.
- Jodha, N.S. (1996), "Mountain Agriculture" in Messerli, B. and Ives, J.D. (Eds), *Mountains of the World: A Global Priority*, The Parthenon Publishing Group, London and New York.
- Jodha, N.S. and S. Shrestha (1994) "Towards Sustainable and More Productive Mountain Farming", in Proceedings of the International Symposium on Mountain Environment and Development: Constraints and Opportunities, International Centre for Integrated Mountain Development, Kathmandu.
- Kim, K.U. (1998), "Mechanisation of Hillside Orchards in Korea," in Proceedings of the Workshop on Perspectives on Sustainable Farming Systems in Upland Areas, Asian Productivity Organization, Tokyo, Japan.
- Lu, R. (1992), *Seabuckthorn: A Multipurpose Plant Species for Fragile Mountains*, Occasional Paper No. 20, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu.
- Nakagawa, S. (1998), "The Current Situation and Future Challenges in Slope Land Agriculture in Japan and Asia" in Proceedings of the Workshop on Perspectives on Sustainable Farming Systems in Upland Areas, Asian Productivity Organization, Tokyo, Japan.
- National Commission on Farmers (NCOF) (2005), *Serving Farmers and Saving Farmers: Crisis to Confidence*, Hill Agro-ecosystem, Second Report pp. 142-228, Ministry of Agriculture, Government of India.
- National Commission on Farmers (NCOF) (2006), *Serving Farmers and Saving Farmers: Jai Kisan: A Draft National Policy for Farmers*, Fourth Report, Ministry of Agriculture, Government of India.
- Partap, T. (1995), *High Value Cash Crops in Mountain Farming: Mountain Development Processes and Opportunities*, MFS Discussion Paper Series, No. 95/1, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu.
- Partap, T. (1998a), *Sloping Land Agriculture and Resource Management in Semi-arid and Humid Asia: Perspectives and Issues in Perspectives on Sustainable Farming Systems in Upland Areas*, Asian Productivity Organization, Tokyo, Japan, pp. 38-84. www.apo.org.
- Partap, T. (1998b), "Marginal Lands and Marginalised Farmers of the HK-Himalayan Region: Sustainability Challenges and Opportunities," Paper presented in the DSE-ZEL-ICIMOD, International Conference on Mountains 2000 and Beyond: Sustainable Development of the HK-Himalayan Region. Wildbad Kreuth, Feldafing, June 21-23, 1998.
- Partap, T. (1999), "Sustainable Land Management in Marginal Mountain Areas of the Himalayan Region", *Mountain Research and Development*, Vol. 19, No.3, pp. 251-260.
- Partap, T. and U. Partap (1996), *Warning Signals from the Apple Valleys: Increasing Pollination Problems* ICIMOD, Kathmandu, Nepal www.icimod.org.
- Partap, T. and B. Partap (2010), "Mountain Farmers Adaptive Strategies in Response to Impact of Climate Change on their Livelihood Options", in Proceedings of the International Symposium on Benefitting from Earth Observation: Bridging the Data Gap for Adaptation to Climate Change in the HKH Region, held during October 4-6, 2010, published by International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal. www.icimod.org.
- Partap, T. and C.S. Vaidya (2009), *Organic Farmers Speak on Economics and Beyond: A Nationwide Survey of Organic Farmers Experiences in India*, Westville Publishing House, New Delhi, p. 161.

- Pokhriyal, H.C. and N.S. Bist (1988), "Planning for Agricultural Development in the Himalayan Region: An Environmental Approach", *The Environmentalist*, Vol. 8, No.1, pp. 47-56.
- Scherr, S., L.A. Jackson and S. Templeton (1995), "Living on Edge: Crafting Land Use Policies for the Tropical Hillside in 2020", Paper Presented in the Workshop on Land Degradation in the Developing World: Implications for Food Agriculture and Environment to the Year 2000, Annapolis, Maryland, U.S.A.
- Sharma, H.R. (1996), *Mountain Agriculture Development Processes and Sustainability: Micro-level Evidence from Himachal Pradesh* Discussion Paper, Series No. MFS 96/2, International Centre for Integrated Mountain Development (ICIMOD), International Centre for Integrated Mountain Development, Kathmandu.
- Sharma, H.R. and E. Sharma (1997), *Mountain Agriculture Transformation Processes and Sustainability in the Sikkim Himalayas, India*, Discussion Paper Series No. MFS 97/2, International Centre for Integrated Mountain Development Kathmandu.
- Shrestha (1992), *A Study on Indicators of Unsustainability of Hill Farming in Nepal*.
- Sugaya, H. (1998), "Japan - A Country Report", in Proceedings of the Workshop on Perspectives on Sustainable Farming Systems in Upland Areas. Asian Productivity Organization, Tokyo, Japan.
- Takatsuji, T. (1998), "Labour Saving Technologies for Citrus Fruits on Sloping Lands", in Proceedings of the Workshop on Perspectives on Sustainable Farming Systems in Upland Areas, Asian Productivity Organization, Tokyo, Japan.
- Tulachan, P.M. (2001), *State of Mountain Agriculture in the Hindu Kush Himalayas: A Regional Comparative Analysis*, International Centre for Integrated Mountain Development, Kathmandu.