



Constraints in Crop Diversification and Measures to Overcome in the Tribal Areas of Himachal Pradesh: A Case Study of District Lahaul and Spiti

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Abstract: Agriculture is the predominant occupation of the overwhelming number of households in the study area. The traditional crops on the uneconomic holdings used to be barley, buckwheat, pulses, local peas (black pea) mustard etc. Out of total owned land 435.11 hectares, net area sown has been worked out 281.69 hectares constituting 64.74 per cent area under crops to land utilization, the cropping pattern in the study area is one of the important indicators to determine the extent to which an efficient use of land is being made. Since the holdings are very small, the intensity of cropping is low and subsistence living was the core of the agricultural economy of the sample households in seventies. The tribal district Lahaul-Spiti of Himachal Pradesh has been endowed with varied climatic and topographical conditions which have provided the area with varied agro-potential. Although the agro-climatic conditions prevailing the study area are quite conducive to the production of cash crops like potato, green peas, vegetables, apple, non-food grain crops like manu and kuth yet the varied climatic and topographic conditions restrict the areas for crop specific in its cultivation. Marginal and small farmers are still reluctant to convert their land to cash crops due to insecurity about having food for survival, food habit also discourage to shift in area for commercial crops in a short growing period.

Keywords: Cropping Pattern, Crop- Diversifications, Kuth, Barley

I. INTRODUCTION

The nature of diversification differs across regions due to existence of wide heterogeneity in agro-climatic and socio-economic environments. Hilly states like Himachal Pradesh especially the tribal areas of the district Lahaul and Spiti of the State has the comparative advantage of agro-climatic conditions that are suitable for growing high value cash crops like seed potato, off-season vegetables, vegetables seeds, apple (horticulture crop), manu and kuth etc. Lahaul and Spiti district are two entities geographically and historically. Lahaul and Spiti is the largest district of Himachal Pradesh in terms of geographical area. Total geographical area of the district is 13,833 square kilometres which accounts nearly for one-fourth of the total geographical areas of the state. It has two distinct parts viz. Lahaul and Spiti. Lahaul-Spiti is situated in the North-Western part of Himachal Pradesh and lies between north latitude $31^{\circ}44'57''$ and $33^{\circ}42'54''$ and east longitude $76^{\circ}46'29''$ and $78^{\circ}41'34''$. The agriculture is the main stay of the people of the district. The farming in the areas is highly agro-pastoral and most of the areas are mono crop areas. More than 80 percent working force is engaged in agriculture pursuits. The farming conditions in the area are entirely different as obtaining in other parts of the State. The farmers have to struggle against very heavy odds. They have to put in persistent efforts to survive against vagaries of nature and to tap all the available sources to make out a living out of their often shallow and stony holdings. Almost one crop is grown in a year.

II. LITERATURE REVIEW

Jaglan and Thakur (2006) conducted a study on ecology of changing cropping pattern in Bharmaur tribal area of district Chamba in Himachal Pradesh based on secondary data of sample villages spread across four valleys of Bharmaur region over the period 1974-77 to 1998-01. They concluded that Gaddis have changed their traditional cropping pattern from cultivating local cultivars to the more remunerative crops. This change is more discernible in case of cereals and plantation crops. The apple (*Pyrus mallus*) cultivation has diffused along valley slopes during the recent study period. The area under this fruit in sample villages was merely 0.32 per cent of total cropped area in 1974-77 which increased to 4.29 per cent during 1998-01. Some of the traditional kharif crops namely kodra (*Paspalum scrobiculatum*), chinae (*Panicum miliaceum*) and bhace (*Fagopyrum esculentum*) grown during mid 1970s have now been replaced by cash crops namely – rajmah (*Phaseolus vulgaris*) and urd (*Phaseolus radiatus*). In case of rabi crops, wheat (*Triticum aestivum*) is the staple food crop. But the cultivation of barley (*Hordeum vulgare*) has recorded a decline. They concluded that there are significant spatial variations in cropping pattern during both the periods under discussion.

Rana, Bhagata, Kaliaa and Lalb (2007) examined the impact of climate change in recent years on apple shift to higher altitude in Himachal Pradesh based on climate information and farmers perceptions. They concluded that temperature in apple growing regions of Himachal Pradesh showed an increasing trend whereas precipitation showed decreasing trends in the regions. The chill units calculated showed decreasing trends of chill units up to 2400 msl from Bajaura in Kullu at 1221 msl to Sarbo in Kinnaur at 2400msl. The Dhundi station situated at 2700 msl showed an increasing trend of chill unit at the rate of 25.0 CUs per year. The increasing trends of chill unit at 2700 msl suggested that area is becoming suitable for apple cultivation in higher altitude. These findings have also been supported by the farmers' perceptions which clearly reflected that apple cultivation is expanding to higher altitude in Lahaul & Spiti. The average land use per farm in Lahaul and Spiti showed more than two percent shift towards apple cultivation but it also revealed reverse trend in other apple growing regions. The income of the farmers increased more than 10 per cent in Lahaul & Spiti whereas it showed a decrease of more than 27 per cent in Kullu and Shimla districts from fruits in recent decade compared to 1995. The secondary data on area under apple cultivation also compounded statement that apple cultivation is expanding in Lahaul & Spiti in recent decade. The climate change has demonstrated its impact of decreasing productivity of apple crop in recent years.

Rana and Negi (2012) conducted a study on the changing land use and cropping pattern of the tribal areas of Pangi valley of Himachal Pradesh based on secondary data. They concluded that, there is a tremendous pressure on the limited available land because of growing developmental activities as centre and state governments are making the serious effort for the tribal development. They further, said that people were shifting their cropping pattern to horticulture and cash crops from the traditional crops with growing facilities. Therefore, need of the hour is to adopt an alternate model of development where inclusive growth must be the nucleus of the planning by which least harm is done to the fragile ecology and environment.

III. OBJECTIVE:

- (i) To identify constraints in the process of shift in area and cropping pattern and
- (ii) to suggest measures to overcome these constraints.

IV. Methodology

The study is based on secondary data as well as primary data. The secondary data for the study have been collected from various sources and government agencies like Department of Agriculture and Horticulture, Directorate of Land Records, Directorate of Economics and statistics etc. the data has been collected by personal field visits and face to face interviews. A sample of 288 households spread over 12 sample villages in two development blocks in the district has been selected randomly. There are 12 crops with varying hectares grown in the district and 1979-80 and 2009-10 comprehensive schedule has been used for data collection.

V. CONSTRAINT IN THE PROCESS OF SHIFT IN AREA AND CROPPING PATTERN

The tribal district Lahaul-Spiti of Himachal Pradesh has been endowed with varied climatic and topographical conditions which have provided the area with varied agro-potential. Although the agro-climatic conditions prevailing the study area are quite conducive to the production of cash crops like potato, green peas, vegetables, apple, non-food grain crops like manure and kuth yet the varied climatic and topographic conditions restrict the areas for crop specific in its cultivation. Marginal and small farmers are still reluctant to convert their land to cash crops due to insecurity about having food for survival, food habit also discourage to shift in area for commercial crops in a short growing period. In view of these facts, it has been observed the following main inherent constraints in shifting area and cropping pattern in the study area:

Geographical Constraints

The geographical features in the area has highly rugged terrain, inaccessibility, dry soil, cold arid climate and high altitude make it difficult for human habitation and agriculture. Vast areas of arid land lie un-utilized in the wake of inadequate irrigation facilities and the permanently snow-clad slopes.¹ Heavy landslides and avalanches destroy each year's irrigation channels, crop fields and vegetations. The vegetation in the area is scanty and soil are loose having fragile strata. The strong winds and avalanches especially during autumn and winter season cause heavy soil erosion depleting the fertile top soils. Therefore, land conservation measures need due consideration etc. to warrant the desertification of land especially in Spiti. In view of geographical conditions in the area, lower and higher altitudes follow different cropping patterns. At lower elevations two crops are harvested in one growing season, barley followed by buckwheat. However, in the higher reaches, monoculture is the primary farming practice through the short growing season.

Land Locked Area

The district is remotely located in the outer-Himalayas beyond high mountain passes where habitation is at an average altitude of 10000 ft above the mean sea-level. Because of heavy snowfall during winter, Lahaul-Spiti particularly Lahaul valley remains land locked for varying period ranging from three to six months. Air service (helicopter) is only then for mobility and transport for majority area. Agricultural takes area carried out in only one cropping season. Until recent decades, agricultural practices were traditional with high crop diversity. Recently cash crops such as potato, green peas, vegetables, apple have gained favour in cultivation. Due to this factor, the Lahaul-Spiti is characterized by low availability of culturable land, lack of diversity in economic activities, poor accessibility, inadequate infrastructure, lack of employment opportunities, out migration and distinctive socio-cultural life style.

Small land holdings:

Agriculture in the area is dominated by marginal and small farmers, these two categories together account for about 46.10 and 26.50 per cent of the total holdings and 13.60 per cent and 24.80 per cent of the total operated area respectively. During 1980-81 and 2005-06 the number of holdings increased by about 25.50 per cent from 3308 to 4152 while the area operated increased by just 7.00 per cent from 5976 hectares to 6410 hectares. Marginal and small farmers are still reluctant to convert their whole part of land to cash crops due to insecurity about having food for survival. Instead, they grow barley, wheat, buckwheat, local peas and other subsistence crops that do not require high capital investment. Such farmers can ill afford the cash crop inputs of high yielding varieties seeds inorganic fertilizers, insecticides and modern agricultural implements etc.²

The Short Working Cropping Season:

The short working cropping season of 6-7 months extending from March-April to September-October as area remains under snow for the remaining part of the year. Therefore, only mono-cropping is possible and all the activities from sowing to harvesting to marketing are completed during the short working season. In such circumstances any delay in inputs delivery and output sale would imply losing one year production.

Lack of infrastructure:

The district is sparsely populated and villages are secluded and scattered over a vast geographical area accounting nearly one-fourth of the total geographical area of the State. The infrastructural facilities are still inadequate. There is yet no regulated market in the whole district nor are there notified collection Centre's. As such the development cost is exorbitantly high in comparison to other areas. This aspect does need a due consideration in development planning.

Irrigation:

The rugged terrains, absence of rains and thin cap-soil have restricted the land under cultivation. In this district not even a blade of grass grows without water. For taking up any type of extension of vegetation, the prime need is of assured irrigation facilities without which no additional area can be brought under it. The land is irrigated by flow system. The rivers which flow through deep gorges are incapable of being tapped for irrigation. Thus, lift irrigation has to be provided which in view of extremely cold winters is possible only when electric power is available for the purpose. Even when such schemes are undertaken, the area that may be covered would be very little because of the nature of the terrain.

Food Habits and Preference for Traditional Crops.

The Table-1 reveals preference of the sample households for the cultivation of high value cash crops and the traditional low value cash crops in the study area. The table shows that 89.24 per cent sample households have preferred to grow green peas mainly because of high return and easy marketing of which 42.01 per cent on the marginal, followed by 27.78, 16.67 and 2.78 per cent on the small, medium and large size of holdings respectively. The second preference has been observed for the cultivation of potato by 59.82 per cent sample households owing to higher return, marketing through Lahaul Potato Marketing and processing cooperative society of which 28.12 per cent on the marginal, followed by 19.44, 10.07 and 1.39 per cent on the small, medium and large size of holdings respectively. Although barley crop is a traditional and low value crop in the study area yet it has 3rd position in preference for its cultivation on account of strong food habits as well as food security among local residents as barley and wheat are important staple food of the people as such it has been observed that 32.29 per cent households have still cultivated barley crop particularly in the sample villages falling in Spiti Development Block, partly in Kolong panchayat in Lahaul development Block and its adjoining areas of Lahaul valley inspite of the facts that these crops have low economic value as compared to other high value cash crops like green peas, potato etc. of which 12.50 per cent on the small, followed by 9.37, 9.03 and 1.39 per cent on the marginal, medium and large size of holdings respectively. The apple cultivation has fourth position among all crops grown in the area as 30.90 per cent households have preferred this, due to prevailing suitable climate in lower altitude and high return to the farmers of which 12.15 per cent on the small, followed by 11.46, 5.90 and 1.39 per cent on the marginal, medium and large size of households respectively. Similarly, 12.50 per cent households have grown manu non-food commercial crop because of its high return and less cost of cultivation of which 5.90 per cent on the small, followed by 4.17 and 2.34 per cent on the marginal and medium size of holdings respectively. The large category of households have not cultivated manu crop due to their preference for other cash crops. Like barley crop, the cultivation of local peas are preferred by 8.68 per cent out of total sample households mainly because of their food habits and choice particularly the people residing in Spiti Development Block where local peas is one of the main staple food which the people do not depart without it of which 4.52 per cent on the small, followed by 3.47 per cent on the medium size of holdings.

Table-1**Preference of Crops Grown among the Sample Households**

(in number)

Sr No.	Crops	Marginal	Small	Medium	Large	All
1	Green peas	121 (42.01)	80 (27.78)	48 (16.67)	8 (2.78)	257 (89.24)
2	Potato	81 (28.12)	56 (19.44)	29 (10.07)	4 (1.39)	170 (59.02)
3	Barley	27 (9.37)	36 (12.50)	26 (9.03)	4 (1.39)	93 (32.29)
4	Apple	33 (11.46)	35 (12.15)	17 (5.90)	4 (1.39)	89 (30.90)
5	Manu	12 (4.17)	17 (5.90)	7 (2.43)	---	36 (12.50)
6	Local peas	2 (0.69)	13 (4.52)	10 (3.47)	---	25 (8.68)
7	Kuth	9 (3.12)	4 (1.39)	6 (2.08)	1 (0.35)	20 (6.94)
8	Vegetables	5 (1.74)	2 (0.69)	6 (2.08)	1 (0.35)	14 (4.86)
9	Wheat	---	2 (0.69)	5 (1.74)	3 (1.04)	10 (3.47)
10	Pulses	1 (0.35)	4 (1.39)	1 (0.35)	--	6 (2.08)
11	Buckwheat	1 (0.35)	---	1 (0.35)	---	2 (0.69)
12	Mustard	---	---	---	---	---

Note: Figure in parenthesis indicates to total 288 sample households.

The large category of households have not grown local peas owing to their different food habit, taste as well as preference for other high value cash crops. Like manu crop, the cultivation of Kuth another commercial crop are preferred by 6.94 per cent sample households on account of high return and social security due to long capacity for storage of which 3.12 per cent on the marginal, followed by 2.08, 1.39 and 0.35 per cent on the medium, small and large size of holdings respectively. In 1950 kuth and manu were promoted as cash crops and this effort peaked by 1970,s and these crops are now grown only by a very few locals. The cultivation of vegetables are preferred by 4.84 per cent out of total sample households on account of climatic conditions prevailing in lower altitudes covering the sample villages Jahalman, Phura, Lari and Tabo where the climate suits for its cultivation as well as high returns to the farmers of which 2.08 per cent on the medium, followed by 1.74, 0.69 and 0.35 per cent on the marginal, small and large size of holdings respectively. Likewise, wheat crop is also uneconomical crop as compared to commercial crops as such it has been observed that 3.47 per cent households have still cultivated wheat crop due to food habits of the people of which 1.74, 1.04 and 0.69 per cent on the medium, large and small size of holdings respectively. The marginal size of holdings have not grown the crop due to their preference for other high value cash crops. It has also been observed that buckwheat which used to be second crop after harvest of barley crop in seventies and eighties has now little scope of its cultivation owing to preference for high value cash crops as such 0.69 per cent households have their preference for growing buckwheat of which 0.35 per cent each on the marginal and medium size of holdings respectively. The remaining small and large category of households has not grown the crop due to their preference for other commercial crops. Similarly, 2.08 per cent sample households have preferred the cultivation of pulses of which 1.39 per cent small, 0.35 per cent each on the marginal and medium size of holdings respectively. The large size of holdings have not-cultivated the crop owing to the preference for other cash crops. The cultivation of mustard crop has completely been vanished in the area due to strong impact of crop diversification.

Agro Forestry unlike other Livestock Rearing is Full of Challenges

The verdant pasture lands, no doubt sustain large number of migrant pastoralists during summer but in winter months even dry twigs are at premium as there is acute shortage of fodder. Thus, agro forestry also needs to be included part of development strategy.

From the above facts it has been found that the most of the tribal households residing in sample villages falling in Spiti and Kolong Panchayat have still preferred to grow barley and local peas mainly because of their strong food habits as stable food inspite of the facts that barley and local peas are low value crops.

V. MEASURE TO OVERCOME THESE CONSTRAINTS

Agriculture is the back bone in the study area of the district Lahaul-Spiti. The peculiar agro-climatic situation in the area has proved to be a boon for agricultural transformation and presently the district Lahaul-Spiti is the most advanced district in terms of commercialization. As maintained above, this district harbours have vast area which is about one fourth of the total area of the State. Most of the resources are still underutilized or unutilized. Therefore, the planning strategy needs to be aimed at developing these untapped resources for the benefits of people. Based on the profile of the district the following measures needs to be undertaken for accelerating agricultural development in the area.

There are verdant (green) valleys and plain patches in Lahaul as well as Spiti forming vast cultivable waste lands (around 600 hectares) that if developed could increase the cropped area substantially by about 20 per cent.

The high value cash crops particularly potato, green peas, vegetables are the potential crops fetching lucrative returns due to good quality and off-season production. Special efforts need to be made to increase the area under these crops in Spiti area that presently is very low in comparison to Lahaul. The delivery mechanism for supply of inputs to the farmers is one of the most important aspects of direct involvement of the State Government. As most of the distribution net work is concentrated by the public sector it becomes therefore necessary that government undertakes to educate the farmers regarding quality seeds, fertilizer and other inputs as well as the source of obtaining them. It is also imperative that their truly availabilities is also assured.

The irrigation development needs to be given up top priority as without irrigation even the grass would not grow in this dry temperate region especially when there are plenty of irrigation sources in the form of glaciers that are the progenitors of numerous streams and rivulets passing the valley lands in plenty. Gravity Kuhl are the major source of irrigation in the area. The flow irrigation is the major practice in all the crops though the system found least efficient and not suited to loose soil structure in the area. Therefore, there should be more thrust on sprinkler irrigation system and the farmers should be given incentives to patronise sprinkler system of irrigation as there is AMPLE irrigation potential in the area which if exploited can turn the cultivable barren lands into green valleys or apple garden colonies.

As already said, the climate in the area has been found quite suitable for producing high value cash crops particularly seed potato and vegetables especially temperate European vegetables as such the polyhouse technology needs to be popularized to diversify farming.

Another area that is equally important for proper realization of income by farmers is the existence of good extension support. Lack of post harvest management facilities, non-existence of regulated market in the district, inadequate storage and processing units, inaccessibility to output market results in output loss and low-price realization of the agriculture outputs. Government needs to take suitable corrective measures to ensure smooth dissemination of information and technology.

The above stated measures cannot be sustained, if the rate of capital formation in agriculture is not improved. This can be achieved by boosting public investment in agriculture. Though it alone cannot be expected to fill in the investment gap, it would certainly encourage and stimulate private investment. This would require (i) increased public investment in market infrastructure, supportive import and export policies and comprehensive "behind the horder" reforms of market regulations and institutes (ii) reforms in agriculture price policy, taking into account domestic and world price conditions of agriculture output rather than only on the basis of a measure of production cost.

To speed-up the process of shift in area or crop diversification of high value commodities in the study area, various efforts need to take series of measures to reform institutional arrangement which can appropriately integrate production and markets. Among others, immediate measures include ensuring markets, developing roads, creating appropriate infrastructure and encouraging private sector participation for value addition and processing for high value crops like manu and kuth. Apart from

these efforts, establishment of Research Institution also required for providing modern technical know how to the local tribal farmers particularly expansion of area under vegetables, apple beyond the existing areas and inclusion of new high value crops like hops, floriculture which has high scope for these crops in these areas. The technical know how for increasing productivity of non-food crops like manu and kuth also required to be imported to local growers for saving the crops from their disappearance from the local farmers. Besides this, extension services need to be strengthened for providing latest technical and scientific guidance to the farmers by way of organizing training camps and by conducting visits of local group of farmers to the Research Stations and agriculture and horticulture farms located outside the district.

The livestock rearing is an integral part of farming and the performance of crossbred cows has been quite encouraging especially in Lahaul valley. It is, therefore, the livestock improvement activities need due support for economic betterment of the people. Efforts should be made to revive and popularize Pashmina (cheegu) goats in Spiti area.

Lahaul-Spiti is the most attractive destination for foreign tourist and adventure, and every year thousands of tourists visit the wonderlands of Lahaul and Spiti. Therefore, agro-ecotourism or household tourism needs to be promoted for the economic benefits of farming community in the area.

VI. CONCLUSION

It has, therefore, been conclusion that Lahaul and Spiti district is located in high mountain zones and valley remains cut off from the rest of the world for almost six months from November/December to May/June depending upon winter snowfall. Due to mountainous topography, there is inadequate availability of infrastructural facilities. The rural link roads and irrigation channels require regular maintenance owing to loose soil strata and fluctuating temperatures is the important constraint in the successful growing of high value cash crops, especially perishable vegetable crops. Agriculture is dominated by marginal and small farmers. The cropping season is very short and mono cropping is practiced. In spite of all these constraints, there is significant change in the cropping pattern with traditional crops like barley, black (local) pea, buckwheat, local wheat being increasingly replaced by cash crops like green peas, potato, vegetables including cabbage, cauliflower and brockley. Apple another cash crop, is gaining popularity due to prevailing suitable climatic conditions. The factors that have led to the introduction of high value cash crops include improved road connectivity, better means of transportation, better irrigation facilities, emerging new market, demonstration effect, availability of new crop inputs, chemicals and fertilizers, decline in the demand of traditional crops due to changing food habits. The officials of the state department of agriculture and horticulture, followed by relatives and friends of the farmers have been most important sources of information about new crops/technology. The other sources like traders from outside and farm scientists in the agriculture research stations at Kukumsari and Tabo also helped in popularizing cash crops/agricultural technology. The most important measures to overcome the constraints as policy support, therefore, would be enhanced investment on agricultural research and development for evolving new technologies to not only retain but also strengthen the comparative advantage being enjoyed by the district as well as the state.

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