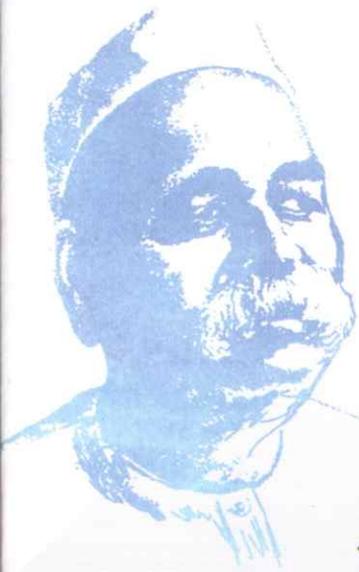


Pt. Govind Ballabh Pant

Memorial Lecture: XXVI

Prof. Tej Partap

September 10, 2020

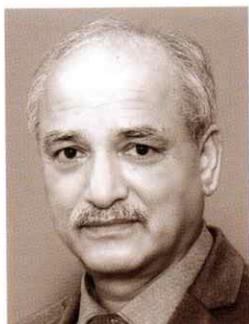


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(An Autonomous Institute of Ministry of Environment,

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- Vice Chancellor, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, 2018-Present
- Vice Chancellor, A.P.G. Shimla University, Shimla, 2015-2018
- Vice Chancellor, Sher-e-Kashmir University of Agriculture Sciences and Technology, Srinagar, 2010-2015
- Vice Chancellor, C.S.K. Himachal Pradesh Agricultural University, Palampur, 2001-2004

Specialization:

- Agro-ecology, Himalayan grain chenopods, neglected mountain crops
- Mountain farming systems - farming niches, technological and policy issues
- Integrated mountain development issues and livelihood concerns, agriculture unsustainability dynamics, and state of natural resources

Awards & Recognitions:

- 2016 President, International Competence Centre for Organic Agriculture, Bangalore, India
- 2003 Founding Member, International Competence Centre for Organic Agriculture, Bangalore, India
- 2000-02 Member, Steering Committee of the Global Mountain Program of CGIAR, FAO, Italy
- 2001 Himachal Ratan Award, HE Governor of Himachal Pradesh, India
- 1994-01 Head of the Mountain Agriculture Programme, ICIMOD, Nepal
- 1996 Honorary Professor in Mountain Agriculture, Tibet Institute of Geography and Natural Resources, Beijing, China
- 1995 Honorary Professor in Mountain Agriculture, Tibet Academy of Agriculture and Animal Sciences, China

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FUTURE OF HIMALAYAN FARM ECONOMY

Trapped in Limits, Conflicts, Aspirations,
and Institutional Apathy

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“No where the Himalayan farmers are aspiring their next generation to continue with farming as a way of life - future is staring at us ”.

A. SUMMARY OF CONCLUSION

The state of the Himalayan farmers and farming is a ground situation report card on the state of affairs about farmers' livelihoods, food security and economic wellbeing in the Himalayan region states. The data and information presented here, has been gathered using different means. Primary data was sourced through group discussions in villages, and house hold surveys of selected farmers. Each village used for field study represented a major farming culture, farming system and care was taken that these are picked up from across the Himalayan states. Above all, as author I had the opportunity of travelling across the 10 Himalayan states during the project period, 2016-2018, gathering plenty of firsthand knowledge on state of affairs. For convenience of the reader, the analysis of the findings is presented before the findings, over here.

The state of Himalayan agriculture, described in earlier sections, is dominated by highlights of a scenario that reflects different dimensions of a mega change process, that is under way. The nature of climatic conditions and availability of resources, notably water, is changing. The economic aspirations of the mountain farmers are changing and so is the case with their social values. Overall essence of the state of mountain agriculture, is indicative of a change process that is underway across the Himalayan states, and the difference among states is only in its scale, speed, response systems and consequent impact. Some have been quick to understand the need for guided change while others have not responded as well.

The transforming scene of Himalayan agriculture is a mixture of good and bad experiences of mountain people, that involved many drivers of change process. For convenience of understanding, the variety of these drivers are grouped under three broad categories; ecological drivers of change, economic drivers of change and social drivers of change. Social and economic drivers of change are put together as socio-economic drivers of change.

Ecological attributes of biodiversity i.e. richness of ecosystems, species and genetic diversity are always closer to subsistent agriculture systems. Potential within Himalayan agrobiodiversity does exist for supporting promising economic transformation of mountain agroecosystems, that farmers can take forward but a vision and the institutional strategies both have been lacking. Present trends do not show much hope of a balanced strategy of agrobiodiversity conservation with development.

The process of sustained economic growth is reaching the unreached mountain societies, so that they are rapidly getting richer in terms of income per person. The region is passing through the age of convergence, which seems instrumental in creating a virtuous cycle of economic growth, a fact that cannot be ignored. The income of mountain households of the Himalayan states is now coming, both from niche based farm incomes and non-farm sources. The meaning of poverty is also being redefined and it is no longer food insecurity but economic well being of the families that is taking over the past thinking. Well being itself is perceived locally by hill people, broadly as contentment w.r.t. economic, health and social well being.

The way mountain/hill people used to live is also changing fundamentally, i.e. from rural roots to urban civilization. It is perceived that the urbanization process will fundamentally change strategic approaches to

address issues of food and income security, poverty and livelihoods in these mountain areas. A debate within the family goes on for and against change, a change within farming and of making a living outside farming. Who wins and who loses, a social determinant, decides the future of farming within mountain families. As a multiplier effect it is deciding the course of unfolding events on the mountain landscapes and valleys of the Himalayan region. Unaware of impact of the social changes underway within mountain communities, the outcome often is resulting in mismatch of institutional efforts with the mountain farmers' aspirations. It is not therefore helpful in designing any strategy for a guided change process.

The state of farm economy and livelihoods of the Himalayan farmers, comprising diverse farming communities, presents a mixed scenario of despair and hope. Mixed farming cultures traditionally focusing on food grains and livestock based livelihoods appear threatened, today. The scale of pressure on these traditional subsistent systems differs from area to area and state to state. Dependence on them has definitely reduced and their continuation, today, is dependent on the access to any alternative opportunity, on farm or off farm. Mountain farmer is willing to try alternatives that make a better future for his next generation. *“No where Himalayan farmers are aspiring their next generation to continue with the subsistent farming or farming as a way of life”*.

The state of Himalayan farming highlights the facts that, the business as usual cannot continue. We have to accept the fact that Himalayan rural population has increased tremendously (one study estimated the increase is 75 times). More people in farming with greater aspirations of better life would mean the need for more resources, land and water. However, over all crop land in the Himalayan states is not more than 11% of total land area, some states have even less than this. Availability of crop land per household is at critical levels of less than a hectare and it continues to shrink further with more nuclear families joining the Himalayan farming communities. Ironically, all good crop land in the valleys of the Himalayan states, that is the only irrigated land in hills and mountains, is under conversion to non agriculture purposes, under impact of urbanization process.

After land and water, the third ecological driver of change that is presently increasing its disruptive value to mountain agriculture in all the north west Himalayan states, Jammu region in J&K, Himachal Pradesh and Uttarakhand, is the increasing domination of wild animals over the farmers, from partial destruction of the standing crops and partial harvest to no harvest coming home. Govts. suggest technological solutions, and social awareness as part of the solutions with no serious efforts. One has to understand that this problem is ECOLOGICAL IN NATURE and right solutions will be ecological only. Total carrying capacity of an area and population imbalance between humans and animals, are the core issues. It requires designing a strategy that looks at ways to balance population dynamics between users of agroecosystems and natural ecosystems. Giving precedence to technological solutions over ecological alternatives, cannot help solve such problems that involve ecosystem dynamics and ecological principles.

In nutshell, comprehending the change process of Himalayan farming cultures is rather complex; because the drivers of change and their dimensions are varying both in time and space. In local capabilities for managing change, one finds differences in transformation among the Himalayan states. A success story in one state, or in one area in a state does not get repeated easily elsewhere. Organic Sikkim is not being repeated elsewhere in same dimensions, transforming mountain economy through fruit farming and vegetable production in Himachal Pradesh may not be happening on similar scale elsewhere, linking conservation of local resources with development in a people's movement with notable success stories of siri cow and orchids in Kalimpong. Within the Himalayan region states, there are so many local success stories and experiences of failures from which others can learn what to avoid doing. There is lack of lateral flow of knowledge, information, and mechanisms for sharing of experiences, among the people and institutions of the Himalayan states. Too little and too slow is the best suited phrase for it. Much scope exists for evolving mechanisms of cooperation among the Himalayan farmers and institutions of these states for lateral partnership.

THE GENERATIONAL CHANGE EFFECT IS EMERGING, even if slowly. Grandfather to father generation with old mind set of food security from farm as first priority to economic prosperity aspirations of new generation. For the old generation of farmers agriculture has been a way of life, however new generation would like to look at it differently. Farming must either be a promising vocation offering a decent way of life or one would not like to adopt it. These social values are forcefully changing the ways mountain farmers will evolve farming based livelihoods and economy of the future.

B. SUMMARY OF FINDINGS OF THE HIMALAYA WIDE STUDY, 2016-2018

1. The Himalayan Agricultural Landscape:

The Himalayan region of India includes 9 states, namely, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Mizoram, Tripura and two union territories, Jammu and Kashmir and Ladakh, as well as the hill regions of 2 states viz. Assam (Khasi Garo hills) and west Bengal

(Darjeeling and Kalimpong districts). Three major geographical entities, the Himadri (greater Himalaya), Himachal (lesser Himalaya) and the Siwaliks (outer Himalaya) extend over an area of 5000 sq kms.

Indian Himalaya is home to 46 million people, living in little over seventy three thousand villages and nearly five hundred towns. More than 70% population of these Himalayan states lives in rural areas but among these states there is large variation. Such as while 90% people in Himachal Pradesh live in villages, but in Mizoram rural and urban population is 50% each. In Uttarakhand rural and urban population is 70:30. Other Himalayan states fall in between.

Himalayan farmers' land resources for farming are of two types. One, crop land that is private property and remains under tillage or perennial plantations of fruit trees. Two, the other type of land that supports farming based livelihoods is called the support land. Its ownership is not with farmers but they use it for animal husbandry. The dependence on this support land could be absolute or partial, depending on the nature of farming system. Pastoral and agro-pastoral nomadic communities of north west Himalayas in Ladakh, Kashmir and Sikkim in North east Himalaya, have absolute dependence on it. In the north east Himalaya there is yet another kind of support land based livelihood system, i.e. land under shifting cultivation. Here the support land i.e. community forest land, is converted into farm land for certain period of time and then abandoned as forest land for some period. Rest periods have been varying from 15-20 years in the past to 2-3 years now.

The scenario of crop land in the Himalayan states presents a variable scenario of scarcity to adequacy from west to east. Despite the fact that there is almost constant availability of agricultural land at aggregate level. However, during the past few decades its food and income supply for individual farming households has declined significantly. There is not any major change towards conversion of other land use into agriculture within the Himalayan states, even though there is widely held perception that large scale conversion of forest land to agriculture has taken place in the Himalayan states. Practice seems to have drastically reduced during the past three decades, if not stopped. The average size of holdings for the Himalayan farmers has declined over the years and for all classes and put together it has come down to around one hectare and even less in NW Himalaya. It has reached a stage where, to do traditional food grains based mixed farming on such small pieces of fragmented farm land has become non-viable both for food and income security of majority of farmers. However, availability of crop land in North East Himalayan region states, is largely better than North West Himalayan states. Among the states witnessing the increase in average holding size, is Nagaland where it increased by about 25 per cent. In Arunachal Pradesh and Meghalaya access to crop land size has increased by about 6 and 3 per cent respectively, over a decade. Even though the issue of shrinking crop lands is so wide spread and common and that non-viable farming due to this is so well known but no state has as yet put in place any strategy that would help contain the situation. Some of the Himalayan states may be in danger of becoming “grave yard of non-viable farming on the small land holdings” as crop land holdings of their farmers continue to shrink further.

The conclusion that can be drawn at present (2018) is that the Himalayan agriculture may not be shrinking in terms of total crop land area in the region, but it definitely is shrinking, in terms of land availability to individual farming families. If the process of division of land holdings among the families continues, then by the year 2040, shrinking crop land crisis will make it difficult to survive on agriculture. The crop land scarcity issue is of urgent nature and requires states to think of strategies that can reverse negative impacts of it on the Himalayan farmers and farming. Some of the NE states are exceptions to crop land crisis.

2. Himalayan Farmers Changing Farming - Macro View:

Cereals alone offered little hope for bringing Himalayan farmers out of poverty. Therefore, new cropping systems have and are emerging, with fruit and vegetables cash cropping. Cash crops are generating significantly higher family incomes and employment. At present about 175 different types of vegetables are grown across the Himalayan states. This fact is normally undermined because of perception of the need for conserving native agrobiodiversity. The particular suitability of hills and mountains for horticulture, have resulted in shifting of cropping patterns from agriculture to fruit crops in the past few decades.

These facts clearly demonstrate that a process of change has been set in motion, in the Himalayan states, which appears irreversible, motivating the farmers to divert the cultivated lands for cultivation of commercial crops. Even though there is wide variation among states in the scale of adoption of diversification. Kashmir and Himachal are the two leading states so far but some NE states are making serious efforts towards diversification. In this process, farmers have been able to harness the local niches, provided by the agro-climatic and socio-economic conditions, to a larger extent. The process of shift in cropping pattern to cash crops, therefore, appears to have pushed food grains farming in the Himalayas to lesser degree and future trends indicate dominance of cash cropping of vegetables, fruits, floriculture, medicinal and aromatic plants, across the Himalayan states.

The situation in the North Eastern Himalayan region is entirely different with two distinct types of agricultural scenarios, Shifting cultivation (*Jhum*), and Settled or plains land agriculture in the valley areas. It has been estimated that 19.91 lakh hectares (83.73%) of the land in the region is under shifting cultivation. However, the area under shifting cultivation has declined from 2.69 to 1.00 per cent of total geographical area and from 2.99 to 1.35 per cent of hill area, during the period 1974 to 2008-09 and the process continues. Certainly by 2040, it will have drastically gone down. There is a trend of farmers moving towards cash crops on larger scale, leading to significant reduction in shifting cultivation.

The single largest casualty of transformation of agriculture from subsistence to cash economy is, near elimination of traditional indigenous crops from the cropping patterns. Several areas of Himachal Pradesh and Kashmir valley reflect this trend. Similarly, the agro-biodiversity of the Central Himalayan agroecosystems has also changed steadily. A survey in several villages of Uttarakhand in the Central Himalaya by Dr. R.K. Maikhuri of GBPNHE revealed that the cultivated area under many traditional crops has declined significantly between 1980-2000. In animal husbandry sector farmers are opting for cross bred cows in fewer numbers, instead of indigenous cows in larger numbers. Replacement of draught animal power, bullocks, from NW Himalayan and Central Himalayan states had started before but accelerated during the past 15 years and is being replaced by machines. Increasing problem of abandoned cattle on road sides in Jammu, Himachal Pradesh, and Uttarakhand is an outcome of this shift in livestock resource use by Himalayan farmers.

The impact of global warming i.e. increasing temperature at local level, is now being felt in the form of difficulties about continuing farming of certain temperate fruit crops. Apple is one such fruit crop and it is being replaced by other fruit crops, plums, pomegranates and persimmons. Warmer and sometimes drier, sometimes too wet, sometimes untimely too cold, local weather condition, and erratic rainfall pattern, widely experienced over the past one decade, have confused Himalayan farmers and they are fearful of uncertain futures. Climate change is also perceived to have affected the irrigation water availability, necessary for cash cropping.

For making agriculture profitable on the marginal and small hill farms, intensive agriculture holds the key for them. In some vegetable growing areas of hilly landscapes, the cropping intensity has already passed 200 per cent, e.g. vegetables growing area of Solan district in Himachal. Commercialization of Himalayan agriculture has increased the farmers' dependence on external inputs, be it seeds, fertilizers, labour and mechanization. In present times-2016-18, farmers are feeling general scarcity of labour caused by increasing demand in cash cropping, affordability by the farmers as well as declining trend among local people to work on others farm land as agricultural labour because of alternative choice available to get employment under MANREGA. Labour is now accounting for nearly half of the total variable costs of cultivation. As a result, seasonal as well as permanent (few years) immigration of migrant labour is there and it is increasingly being used not only by the medium and large farmers, but also by the small farmers. The market orientation of farming has tremendously increased the farmers' interface with market functions. Emerging new age farmers are also conversant with the application of on line marketing, and is specially used for marketing flowers, fruits and vegetables.

There is, however, wide variation in respect of commercialization of agriculture in different Himalayan states. Small farmers in states like Uttarakhand and North East are still tied with growing of traditional subsistence food crops. This is considered as one of the causes of migration from the hills of Uttarakhand leading to over 1700 plus ghost villages at the last count in 2018 and abandoned agricultural landscapes across several hill districts of UK.

From the economic well being view point, commercial farmers of Himachal Pradesh, facilitated by higher income, are now spending much more as compared to other Himalayan states, as demonstrated by the findings of 68th Round-Consumer Expenditure Report of NSS. Average monthly per capita consumer expenditure (Rural) for different Himalayan states reveals the variation; Rupees 1782 for Arunachal Pradesh, and Rs. 1219 for Assam, Jammu and Kashmir Rs. 1743, Manipur Rs. 1502, Meghalaya Rs. 1475, Mizoram Rs. 1644, Nagaland Rs. 2029, Sikkim Rs. 1565, Tripura Rs. 1334 and Uttarakhand Rs. 1726. Farmers of Himachal Pradesh are rated top consumers with av. Rs 2034 per month spending. The all India average stands at Rs. 1430. It indicates that farmers of the Himalayan states are comparatively better-off economically and that among them Himachal farmers enjoy comparatively better economic well being.

The fact that hill farming dominated by commercial crops is on the rise, both area and production wise. But there is a significant drop in local crops area and production. Traditional approaches of commercialization of hill farming may have improved economic well being but it has made a dent on traditional resource base and resulted in shrinking native agrobiodiversity. Transformation process has helped in emergence of new breed of farmers who are known as progressive farmers, agribusiness entrepreneurs or name them as new age farmers. They are often educated and becoming role model for majority of other farmers.

2.1 Himalayan farmers livelihoods and economy- micro level evidence:

Today most prevalent farming systems of the Himalayan region are:

- i. *Subsistent rain fed crop livestock mixed farming system,*
- ii. *Apples/ fruits dominated farm economy*
- iii. *Both fruits and vegetables dominated farming*
- iv. *Hill farming threatened by wild animals and abandoned cattle population*
- v. *Slash and burn agriculture of NE Himalayan states*
- vi. *Pastoral & Agro-pastoral Nomadic systems of the high mountains*

The shrinking farm land problem was prevalent across first five agriculture systems, where farm land holdings were less than a hectare. In Nagaland, however, either there were large land holdings of few farmers or there were land less labourers or the community land users of shifting cultivation. In the apple orchardists village of Kashmir and the vegetable and fruit farming village of Himachal Pradesh, people were more concerned, for them changing climate, shrinking land holdings, and lack of marketing infrastructure were key concerns.

In the villages having subsistent mixed farming systems, where rain fed farming on sloping farm lands was prevalent, the key concern was wild animal menace and farmers were mostly not able to take home any harvest. For the nomadic highlanders, who depended on vast rangeland resources, the issue is vast range lands but less people and migration of local families to far away mountain towns. What is happening consequently is, less number of nomads, semi nomads but larger flocks of goat, sheep, yak, as others sell their smaller flocks of livestock to those who are staying out. It is similar storey with Changpas of Ladakh, Bakarwals of J&K, Gujjars of Jammu, Gaddees' of Himachal Pradesh, Van Gujjars of Uttarakhand, Yak herders of Sikkim and Arunachal Pradesh. Warning signals from Himalayan nomadic communities is that the system is shrinking to extinction.

Commercial farming households in Kashmir (apples) and Himachal Pradesh (vegetables and fruits) have far higher annual earnings from farming. There is wide disparity in the annual incomes of Himalayan farming families. Farmers who had bigger orchards were earning between Rs. 1.5 million to Rs. 2 million. There are apple orchardists in Kashmir and Himachal Pradesh, but outside of sample villages, whose annual incomes have been reported between Rs. 10 million to 30 million every year. The role of non farm income sources to sustain rural livelihoods is increasing and this source comprises largely low paid unskilled jobs.

The cash cropping, supply of subsidized food grains (rice and wheat) under PDS across the Himalayas, even in remote villages, shrinking land holdings leading to focus on few major crops cultivation, access to new HYVs of food crops or cash crops, are making farmers stop eating local grains and abandon farming of the indigenous crops.

The national program of PDS engineered changes in farming cultures i.e. from food crops to cash crops and from farming to non farming vocations. PDS supplies meet the staple food needs of all families for half a month and MANREGA does the rest by empowering farmers by food for another two weeks from the open market. For the Himalayan farmers, these two national programs have essentially helped ensure food security among the masses. The regular dietary systems of the past, comprising of maize, pulses, millets, pseudo-cereals and cultivated and seasonal wild vegetables, have been abandoned or are on their way out to be replaced by rice, wheat, non vegetarian dominated diets. Dietary systems have become richer than past and so is the emergence of NCD (no communicable diseases, like sugar and blood pressure). Fair number of North East Himalayan farmers diets however continue to give due place to local food crops and wild foods.

In the subsistent farming conditions of North West Himalayan villages, at the present times only 15% farmers may be producing enough food for themselves. While in NE Himalaya, above 50% farmers are producing enough food to feed their families. That is not the case with vegetable and fruit growing households of Himachal, where these farmers have totally abandoned food crops farming. The transient food insecurity situation occurs in villagers across the Himalayas under all kinds of farming conditions, in varying degrees and overall 38% farmer families of Indian Himalayas face it. "The annual transient food insecurity among mountain households also highlights the fact that, idea of making people food secure on their own farm land is no longer possible in the Himalayan villages."

The wild animals affected farmers speak of yet another persisting crisis. The root cause of food and income insecurity in these villages was that farming failed to meet the food and income needs of people because of destruction of crops by the wild animals- monkeys, bear, porcupines and wild boar. It is now an issue that cannot be undermined. Some farmers have totally abandoned farming their fields while others keep growing some local crops, so that they may get some fodder for the animals.

The rice and wheat are now staple food items but not staple food crops. The Himalayan states are on way to become net importers of food; be it food grains, pulses, cooking oil, that is for sure but when, it would be difficult to guess. It has impacted diets, transforming them from the past locally grown foods, to imported (*into mountains*) foods. The rural food has become urbanized in terms of diet and nutrition. Life style diseases (diabetes, high blood pressure, allergies, cancer) have crept into the mountain communities. It is not uncommon to hear people talking about number of patients of cancer, blood pressure, diabetes etc. in the villages.

3. Farmers Migration- A Case of Uttarakhand Hills:

In Uttarakhand, 86% area is under hill districts but 86% of the crop land of the state is in the plains i.e. tarai. Migration from some of the hill districts is well known. The rate of migration increased during past few decades, just before and after formation of the state of Uttarakhand. Conditions have worsened in some hill districts to the extent that over 1700 villages have no one in there and many more are joining that category locally called "Bhutia gaon the ghost villages". Over all around 4000 villages are presently victims of migration. After the migration, main source of their livelihood, elsewhere, was daily wage labourers mainly in factories, and shops. For them life has become more vulnerable. Consequent to migration, today, only less than 20% agricultural land in the hill districts of Uttarakhand is being farmed and rest 80% has become fallow land for varying periods. The migration commission of Uttarakhand has now undertaken several field surveys to assess scale and causes of migration. These reports have become the basis of Government programmes launched for containing / reversing migration from hills. Year 2020 has become a turning point as COVID -19 cause home coming of migrants is expected to see part of the migrants abandoning their plans to migrate again and rather look for local opportunities to stay on their farmlands.

4. PDS and MGNREGA as Change Agents of Himalayan Famers Livelihoods:

PDS means Public Distribution System- a scheme of GOI for giving subsidized food to poor families. MGNREGA means Mahatma Gandhi National Rural Employment Guarantee Act. How PDS and MANREGA has impacted farming in the Himalayas? General perception is that it encouraged farmers leave farming and become dependent on purchased food. Increasing rate of incidences of abandoned crop lands in the Himalayas is attributed to these two schemes. The study, however revealed a different story. Himalayan farmers considered these two national programs as great opportunity to come out of food and income insecure subsistent farming. Where ever agriculture was barely subsistent and perpetually breeding food insecurity and poverty, those farmers received food security through these two programs and now had the risk bearing capacity to shift to cash cropping. Feeling of a food secure family also encouraged hill farmers to diversify from farming to non farming options." The picture in mountain states depicts, inadequate food production being supplemented by PDS supplies and supplemented income to buy additional food. Where farming families food needs are not met even from subsistent production on their farms plus PDS, in such cases money earned from MANREGA came handy to buy additional food from open market.

The availability of food items at prices which were lower than cost of production on their own farm land, had led to emergence of a situation where farmers were now less keen on growing food crops on their farms. There is an increased demand for non-agricultural jobs which has been able to fulfill the rising demand of cash income of farmers. The diversion of elite labour force to vocations other than agriculture has not only led dwindling number of workers available for agriculture; more importantly, the best brains, so crucial for agricultural development are moving out of this sector. There are two diametrically opposite outcomes of this state of affairs; one is neglect of agriculture due to outmigration of quality work force. But at some places this outmigration has contributed to well being of agriculture sector, by way of higher farm investment, which came from savings from non-agricultural vocations. This has happened in rural areas surrounding urban centres of the Himalayan states.

5. Changing Dynamics Against Agrobiodiversity:

The Himalayan agroecosystems appear under transition with respect to agrobiodiversity. There is whole scale abandonment of millets and pseudo cereals from farming as well as food habits. In villages where cash cropping has been adopted, millets and major traditional food grains have been replaced by new crops, causing loss of local crop genetic resources. These changes indicate preference of farmers for economically productive but biologically less diverse agroecosystems. Farmers are replacing their old system in which they were growing a range of crops and land races of crops. From aiming at managing farms for ecologically sustainable livelihoods, to focus on managing farms for economically promising livelihoods, is the biggest turn around we see in agriculture based livelihoods of the Himalayan states.

In this crop abandonment and replacement process maize crop has become a major casualty. The maize, wheat and rice crops area has been put under vegetable farming by the farmers. About what new crops are making place under all categories of agroecosystems across the Himalayan states ? Farmers list includes fruits

and vegetables, namely, apple, pear, walnut, kiwi, pomegranate, plums, peach, apricot etc. among fruits, and tomato, cauliflower, cabbage, beans, potato, capsicum, cucumber and pumpkins etc. that Himalayan farmers are growing. Effort is made to understand their agroecological niches and then plant new crops. Even though scopes exist for harnessing the potential of native niche crops of fruits and vegetables but that has not happened as yet.

As to why farmers are abandoning crops they used to grow, there is no single reason, some common but others local. Change in food habits is a reason for 20% farmers, another 10% think that the production of these crops was not good. Over 40% farmers think less economic value of their old traditional crops as reason to leave them. Why farmers were adopting new crops? The reason topping the list was higher economic value of cash crop (85%). Climatic conditions favouring introduction of new more promising crops (80%). Third reason is that families are compelled to adopt new high value crops so as to move from food security to economic security. All the three reasons reinforced each other—one can say a combination of these three factors makes a strong reason for Himalayan farmers to move towards cash cropping.

There is an emerging paradoxical situation, the diversity of crops and animals that forms part of the Himalayan agroecosystems, and has been part of the dietary systems supplying all kinds of nutritional needs of the Himalayan communities, it is now being lost. Old crops are being replaced by fewer new cash crops. So far, there was a wide bio-resource base of crops, wild harvest and animals available to these farming communities of the Himalayan villages, which most likely met the needs of human nutrition. However, study indicated that this may not be the case any longer and future of agrobiodiversity based rich dietary systems of the Himalayan farming communities, appear grim. The rapid replacement of both diversity of crops and animals by fewer economically more important species continues.

The percentage share of cereals in total agricultural income of mountain farmers is declining in the Himalayan states. Traditional food grains and cereals, pulses, local vegetables, are being abandoned or have already been abandoned by the farmers. Between 2006-2007 to 2017-2018, the decade has witnessed major shift in cropping patterns from grains and pulses to vegetables and fruits, further reducing area and production of food grains in the Himalayas to almost half the value of 2006-2007. For agriculture economists there is definite evidence of structural changes in the Himalayan agriculture. In North East Himalayan states, there is an emerging trend of conservation and promotion of native livestock breeds. In this context there are quite a few success stories, such as that of native Siri cow revival by a group of 18000 small farmers belonging to 240 farmers clubs in Kalimpong district.

6. Himalayan Farmers Responses to Climate Change:

Our own study (1997 & 2018) revealed that climate change forced the mountain farmers to abandon one set of crops and adopt new ones. The previously prospering apple farmers in the lower areas went through a painful decline process, however the identification of new farming options such as vegetables and other fruits, coupled with government support resulted in a positive outcome. Climate change opened up new and in general more profiting farming options to the lower valley farmers. Similarly, in the upper valley, the altered climate encouraged the adoption of new crop options i.e. apple farming, which brought prosperity into the household economies and society. The area saw a general ascent in living standards of most farmers.

In this case we saw the upward shifting of the apple belt. And those who lost apples discovered vegetables as better new options. Developments by 2018, we saw reversal of the process because of technological interventions to neutralize climate change impact. There is a new thought now, with respect to apple farming / temperate fruit farming in the Himalayas, “APPLE BELT CAN NOW EXPAND BOTH WAYS”, global warming is making it possible to expand apple farming upwards into higher Himalayan ranges and technological advancements are making it possible to move the apple belt down wards, including those areas from where apple crop had earlier vanished. In the present case study in the areas from apple were reported moved up in 2009, they have come back into the same area in 2018 all because of technology. It is possible that technological advancements can be used for negating the negative impact of global warming on mountain agriculture. However, for that planning R&D interventions in ways that effectively reverse the negative impacts is a necessary condition.

7. Emerging New Age Himalayan Farmers:

There are cases of individuals or groups, across the mountain states, who are doing extra ordinary things in farming to show the way how farming can be a promising proposition. The actors ‘new age farmers’, are using extraordinary ways to overcome limitations of small farm size and limited production. They come from all kinds of backgrounds; educated youth from farming families, engineers, professionals, company executives, scientists and many others. Therefore, information was gathered from across the Himalayan region about them. Stories of these farmers helped understand the emerging concept of new age farmers and learn from new age Himalayan farmers their experiences about the challenges and opportunities for mainstreaming the idea.

For the new age Himalayan farmers, one thing in common was their knowledge and innovation based approach to farming. Their engagement with farming was not for survival alone, nor did they see it as an unprofitable vocation. They are taking farming as a profession and their aim is to make it as much profitable, and economically lucrative agribusiness for themselves and for several others who get associated with them. The stories of these individuals, offered a glimpse of the new generation of farmers and how there is a shift in farmers behaviour towards selecting niches, production processes, managing supply chains and marketing and aiming at higher economic returns from farming. Not only that, innovations in collectivization in farming, value chain development and marketing, is emerging as a necessary mechanism to enhance power of other small farmers.

The stories of these new age farmers showed that there can be a positive hope and that mountain agriculture has a future. Presently, knowledge deficit exists. New Age Himalayan Farmers thinking, can be considered a new approach for reviving farming in the mountain areas. Looking at how farmers envisioned innovated and executed their new age farming strategies, new age farming perspective appears as a fountain head of agri-entrepreneurship. The messages emanating from the stories indicated that it is no longer a single man's job to lead the transition into successfully transforming mountain farmers farming based livelihoods. From single farmers to collective efforts for profit making, the stories offer range of fine examples on how to scale up the non-viable farm economy of small mountain farmers into promising viable farming economies. In this context the important point emanating from stories is that the key area we have to learn a lot, in order to succeed, is "collectivization". It will be a buzz word of future farming strategies for the mountains. For achieving success it would require cooperative approaches of all kinds to evolve. The experiences of the new age Himalayan farmers serve as valuable knowledge inputs to chart out new pathways for transforming the farming economies of households, villages, valleys and farming landscapes elsewhere. Essential for mainstreaming new age Himalayan farmers movement, is strong back up support of R&D institutions for technological services, in addition to necessary social engineering innovations.

8. Glimpses of Future: Dormant Power of Himalayan Apple Economy Type Cases:

Agriculture economy of the Himalayan region has a major weakness, it makes a poor case for contribution to GDP/SDP. Therefore an assessment was made to judge the potential value of known niche-apple economy, as test case. Can apple economy of Indian Himalayan states be up scaled over six times to make it Rs. ninety thousand crore (Rs. 9 billion) economy of the Himalayan farmers? What would it mean to Himalayan apple farmers with respect to changes in apple farming practices and to Governments about putting in place enabling policy environment?

The present apple area and economy divides the Himalayan region into two distinct categories, North west and North East region. North West Himalayan states of Kashmir and Himachal lead the way in apple farming and any up scaling w.r.t. modernizing apple farming, varieties and post harvest handling has to first happen in J&K, Ladakh, Himachal and Uttarakhand. Further, NE Himalayan states hold the potential of becoming apple economy driven states of the future. They have vast land area which can be put under apple farming, using new low chilling varieties. But for that to happen, weak R&D institutional capacities of the states, need upgrading. Apple farming in India is not yet modernized to realize its full potential and that the scope exist for improving productivity, area, production and economic returns. For modernization of apple production the issues that will dominate efforts include; HDPs, clonal root stock, new varieties of apples, indigenous Himalayan varieties of apples, innovations in rejuvenating old orchards, better infrastructure for post harvest handling and better supply chain mechanisms. Aiming at ten times increase in the apple economy means that for such a thing to happen, it will require deep thinking on designing long-term strategies.

Only climate should not be considered giving mountain farmers the comparative advantage. So far in the initial phases of cash cropping thrust it worked well but for the coming times it will be too small a window of opportunity. Thinking about up scaling apple farming, unless other technological and institutional factors are managed, up scaling apple economy on larger scale cant not be expected.

9. Glimpses of Future : Under Harnessed Potential of Organic Farming:

All Himalayan states have today organic farming promotion programs, offering farmers with several incentive schemes to adopt organic farming. The result is that there are organic farmers in each state with hundreds of hectares of organic farm land. However, today the leading Himalayan states are, Sikkim, Uttarakhand, Himachal Pradesh and Mizoram. States such as Meghalaya, Nagaland, Jammu and Kashmir are late starters but with national thrust on organic farming these states are making efforts to bridge the gap. Some organic agribusiness entrepreneurs have emerged in some states e.g. Sikkim, Uttarakhand, Himachal Pradesh and even in Nagaland and many more are trying to come up. Export quantities and pool of products is still rather small.

Sikkim's experience in moving towards the organic has largely been positive and is applauded by environmental and ecological experts in India and globally. In the first place, the state government showed a strong political will and policy consistency, along with well-defined targets and implementation plans. Similar strategy can be adopted by other states.

In Uttarakhand, because of dominance of food grains based rain fed mixed farming in the hills, farmers may be willing to adopt organic farming. Today there are several Govt. incentive schemes available to encourage farmers adopt organic farming. However, most important of all is the state policy on adding organic farming as one of the activities under MANREGA. Farmers can register themselves for adopting organic farming on their own farm land and get paid under MANREGA for 100 days in year. It may result in adoption of organic farming by more farmers in Uttarakhand. However, Himalayan states have so far not been able to harness the true potential of organic and present initiatives are only beginning of a long race.

RESEARCH AND DEVELOPMENT EXPERIENCE:

- Coming from a mountain village at around 2500 m in the Kullu Valley of Himachal Pradesh, Indian Himalayas, educated in mountain village environment, professionally working for mountain areas and institutions all these years, Prof. Tej Partap has deep knowledge of the diversity of environmental issues, rural communities, small farmers livelihood concerns and institutional capacities and needs.
 - The widely acknowledged outstanding achievements credited to Prof. Tej Partap also include, the Tibet Agriculture sector Institutional Capacity Building programme; bringing China's sea buckthorn success story to outside world and bringing the Sloping Agriculture Land Technology of Philippines to our part of the world.
 - Working as a professional staff and Head of the Mountain Agriculture Programme at the International Centre for Integrated Mountain Development (ICIMOD), Kathmandu for 13 years he has made significant contributions to mountain agricultural development and considered as an expert. His contributions for institutional development in Tibet have been highly recognized both by provincial autonomous Govt. of Tibet and Chinese Academy of Sciences. Prof. Partap has long experience of international bodies, international initiatives, consortia etc. He combines in him a range of expertise, a researcher, agriculture and rural development programmes' designer, manager, implementation strategist and institutional leader with academic background in ecology and agriculture.
 - Prof. Tej Partap is a rare person, well versed with major mountain regions of the world. He may be among those few who can claim credit for widely travelling and working in the Andean region of South America, Alps in Europe, African highlands, Asian uplands from Thailand to Philippines and Japan and every part of the 8 countries of the Hindu Kush Himalayan region from Afghanistan to China to Myanmar. Working for 30 years in these hilly and mountain areas has helped him gain in-depth knowledge of the integrated mountain development issues, livelihood concerns and agriculture unsustainability dynamics.
 - The National Commission on Farmers, used his services to formulate hill agriculture sector and organic farming sector reports and later he led the team which prepared the Organic sub sector proposal for 11th Five Year Plan. After his role in preparing the Vision and Mission 2020 of Organic Agriculture in India, he is nationally recognized as organic agriculture policy and strategy development expert. States like Sikkim and Himachal Pradesh have already benefitted from his organic strategy development expertise.
 - Dr. Tej Partap, started his career as Vice Chancellor in 2001 at CSK HPKV Palampur and by 2020 he is now a fifth term Vice Chancellor in fourth University. He has long experience of leading hill/ mountain areas farm Universities in Himachal Pradesh, Jammu and Kashmir (12 years) and now in Uttarakhand. He carries with him experience of institutional leadership and management, both at national and international level. For over 33 years now, he is involved in managing institutions, international programs, strategic research initiatives in the field of mountain agriculture and organic agriculture.
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G.B. Pant Memorial Lectures

- I** Dr. M.S. Swaminathan, Director, CRSARD, Madras - 1991
- II** Dr. T.N. Khoshoo, Jawaharlal Nehru Fellow, TERI, New Delhi – 1992
- III** Mr. V. Rajagopalan, Vice President, World Bank, Washington – 1993
- IV** Prof. U.R. Rao, Member, Space Commission, New Delhi – 1994
- V** Dr. S.Z. Qasim, Member, Planning Commission, New Delhi – 1995
- VI** Prof. S.K. Joshi, Vikram Sarabhai Professor, JNCASR, Bangalore – 1996
- VII** Prof. K.S. Valdiya, Bhatnagar Research Professor, JNCASR, Bangalore - 1997
- VIII** Prof. V.K. Gaur, Distinguished Professor, IIA, Bangalore – 1998
- IX** Prof. Y.H. Mohan Ram, INSA Senior Scientist, University of Delhi, New Delhi – 2000
- X** Prof. J.S. Singh, Emeritus Professor, BHU, Varanasi – 2004
- XI** Prof. Madhav Gadgil, Centre for Ecological Sciences, IISc, Bangalore – 2005
- XII** Dr. S.S. Handa, Ex-Director, PRL (CSIR), Jammu – 2006
- XIII** Dr. Lalji Singh, Director, CCMB, Hyderabad – 2007
- XIV** Prof. Roddam Narasimha, Chairman, FMU, JNCASR, Bangalore – 2008
- XV** Dr. R.S. Tolia, Chief Information Commissioner, Govt. of Uttarakhand, Dehradun – 2009
- XVI** Prof. Raghavendra Gadagkar, CES & CCS, IISc, Bangalore – 2010
- XVII** Prof. V. Nanjundiah, JNCASR, Bangalore – 2011
- XVIII** Dr. Kirit S. Parikh, IRADe, New Delhi & Former Member Planning Commission – 2012
- XIX** Prof. Jayanta Bandopadhyay, Former Prof. & Head, IIM, Calcutta – 2013
- XX** Prof. T.S. Papola, Institute for Studies in Industrial Development, New Delhi - 2014
- XXI** Dr. David Moulden, Director General, ICIMOD, Nepal - 2015
- XXII** Dr. Vijay Raghavan, Secretary, Department of Biotechnology, New Delhi - 2016
- XXIII** Prof. S.P. Singh, Former Vice-Chancellor, HNB Garhwal University, Uttarakhand - 2017
- XXIV** Prof. P.S. Roy, Former Director, Indian Institute of Remote Sensing, Dehradun – 2018
- XXV** Prof. Raman Sukumar, Professor of Ecology, Indian Institute of Science, Bangalore - 2019