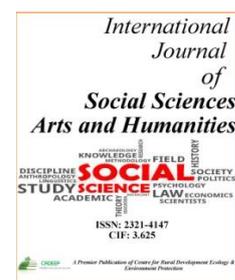


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Livelihood Scenario in Uttarakhand Himalaya – An Analysis of Agriculture based Economy through Case Study of Almora Region, Uttarakhand, India

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ABSTRACT

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The mountain livelihood of Uttarakhand Himalaya, and sectoral contribution to the state's gross state domestic product, are discussed. The comparative analysis reveals a downward trend in the primary sector's (Agriculture & allied) percentage contribution to the state's economy from 40% (1993-94) to 11% (2019-20) and an increase in the relative contributions of the secondary and tertiary sectors from 23% (1993-94) to 46% (2019-20), and 37% (1993-94) to 43% (2019-20) respectively. A case study of the Almora Region is presented for livelihood scenario analysis examining the region's diminishing agricultural status and shifting occupational pattern region is witnessing. The current data reveals that net/gross sown area of the district and contribution of cultivators and marginal category in the working population are declining leads to unemployment and possibly causing migration from the region. Furthermore, the perception analysis is carried out with thorough literature review, and peoples' participation in different blocks of the district to highlight major agricultural issues related to rural livelihood that require action or policy intervention in order to protect and revive agriculture in the region.

Introduction

Mountain Livelihood in Himalayan region from ages have been perceived as a traditional and self-subsistence based, where agriculture was the mainstay for more than 90% of the total population that lived in the villages. With passage of time with the spread of education, growth of townships and industries, ingress of markets, increased mobility and communication, and widespread development - new livelihood opportunities were created which saw a gradual drift of people from agriculture to other emerging areas. The difficult topography, water scarcity, rainfed nature of agriculture, scattered and fragmented landholdings, lack of mechanization/ awareness/ policy support, outmigration for jobs (Banerjee and Kollmair, 2011), and lately increasing human-wildlife conflicts (Rai et al., 2015) were also some of the key reasons that distracted people from agriculture resulting in declining cultivation area, agriculture abandonment, and in some cases complete evacuation of villages. These changes besides the agricultural deceleration have many other adjunct costs manifesting in the form of loss of - traditional crop biodiversity, associated biodiversity values, traditional and indigenous knowledge associated with agricultural systems and practices, decline of NRM institutions that have evolved to regulate/ optimize resource use for environmental protection/ productivity enhancement/ sustainable human-environment management, and threats to food security. Though the development and growth of other sectors is a welcome sign for economy and new livelihood opportunities in the region, but this cannot fulfil the livelihood interests of the large majority of population that lives in the rural areas where livelihood opportunities outside agriculture are very limited. Hence, there is a need to protect and sustain the hill agriculture in the wider interest of the livelihood of the people. This paper is an attempt to analyse the situation in the hill district of Uttarakhand Himalaya using a participatory approach and data gathered from secondary sources to arrive at a conclusion that can be used in policy decisions to restore Agri-based livelihood in rural areas and create opportunities in emerging avenues.

Materials and methods

Study Site

In the middle of Uttarakhand in Kumaun Himalaya, Almora is an important township geographically, historically, and politically which is the headquarter of Almora district. The Almora district is located between 29°35'50" N, 79°39'33" E

& 29°59'71" N, 79°65'91" E and covers an altitudinal range from 1200 to 2800 m above mean sea level in the Kumaun Himalaya. It is surrounded by Bageshwar in the North, Pithoragadh in the East, Nanital in the South, and Chamoli district in the West. The district terrain is specified with forest shrouded mountains that are covered mostly by moderate dense forest (837 sq. km) followed by open forest (682 sq km) and very dense forest (199 sq km) (MOEFCC, 2019) and various precipitation ravines; Kosi and Suwal are 2 major rivers that drain through it. The Almora district comprises of 9 Tehsil, 11 community development blocks, and 1241-gram panchayats. District receives about 1124 mm mean annual rainfall throughout the year which is characterized by highly irregular rainfall, out of which majority of the rainfall (85%) receives on the monsoon season (highest in August 318.7mm, followed by July) (Srivastava and Bhattacharya, 2018), only 7 % of the cultivated area in the district is irrigated.

Methodology

Scholars all over the world have used the PRA matrix technique to examine farmers' preferences and priorities in Agro-forestry (Smith Dumont et al., 2019) and to investigate the importance of a certain crop through an interdisciplinary action research (Cockburn et al., 2014; Gausset, 2004). In regional geography, (N. Narayanasamy, n.d.) describes the function of tools in integrating such priorities into regional development planning. To map the causes of decline in agriculture/agriculture based rural livelihoods in the study area, the PRA Problem Matrix perception analysis exercise was conducted separately in Nerai, Sauda, Chana, Binta villages of the four different blocks of the district on changing livelihood scenario and dynamics of livelihood strategy and summated to arrive at mutually recognized facts to figure out the causes behind the deteriorating state of agriculture.

A checklist of problems responsible for poor agricultural performance affecting its growth was arranged with through literature review; effect of climate change on agriculture and water unavailability (Aggarwal, 2009; Chandra Kuniyal and Kumar Sharma, 2012; Prasad et al., 2016; Shekhar et al., 2010; Tewari et al., 2017) Migration and its consequence (Bhandari and Reddy, 2015; Deshingkar and Akter, 2009; Jain, 2010; Mittal et al., 2008), land losses due to disaster (Kala, 2014; Shukla et al., 2018; Tewari et al., 2017), depleting natural resources and traditional knowledge in management of seeds (Joshi et al., 2011; Joshi and Kumar Sharma, 2011; Rao, 1997), effect of forest fire (Fulé et al., 2021), need of organized organic market system (Mittal et al., 2008) and several other highlighted factors were categorized.

Four FGDs were conducted in these agriculture dominant villages in different blocks around Almora town periphery consisting both open and close ended questions. Participants in formal discussion (FGDs) ranged from 8 to 12 people of the community, who earn the majority of their income from agriculture and allied activities, and have already been practising agriculture for more than twenty-five years, and see agriculture as their household's principal source of income. FGDs and interviews were conducted by researchers in the field having prior knowledge of the objectives and priorities. Field work took place between Sep 2018 to Aug 2021. The listed problems were discussed with the FGD group and modified as per the villagers' views during discussion. In all 18 different problems were listed, the number of relevant problems varied from village to village and in final compilation for consolidated picture responses for all the 18 problems were considered. All problem were ranked against each other during focused group discussion with the help of local community members during FGDs (farmers, male-female members, old community members) in each village to arrive at mutually consensus outcome (N. Narayanasamy, n.d.; Smith Dumont et al., 2019; Swathi lekshmi et al., 2017). The problems that were not relevant for a village, therefore not ranked, counted the last rank i.e., 18, and thus the consolidated rank score for the 4 villages were averaged to obtain the final rank and discussed in result section.

Results

Sectoral contributions to GSDP in Uttarakhand -A comparative analyses of changing livelihood trends:

Uttarakhand was carved out in the year 2000, during the middle of the ninth Five-year plan (1997-02). To date, the newly formed state has seen three more such plans. To achieve the developmental targets of the new state, the investments and opportunities in different sectors were planned and proposed through diverse set of policies. During the 9th five-year plan, the total planned investment (expenditure) for Uttarakhand was Rs. 44300 million which soared to Rs.572520.7 million in the 12th five-year (2012-17) plan. The percentage contributions of various segments of Primary, Secondary, and Tertiary sectors contributing in the economy of state's GSDP at factor cost at current prices for the period 1993-2020 are synthesised and converted to percent contribution of individual sector and sub-sector for more crystalized overview of the economy from various reports on GSDP from Directorate of Economics and Statistics and presented in Table -1. The Table reveals a declining trend in percentage contribution of Primary sector to GSDP and increase in relative contributions of secondary and tertiary sectors to GSDP. The primary sector shows a dip from 40.10% in year 1993-94 to 11.33% in 2019-20, out of which contribution of agriculture sector shows a decline from 33.84% to 8.24% of the respective GSDP values. The percent contribution of secondary and tertiary sector together to the total GSDP shows an increase from 59.90% to 88.67% where amongst the secondary sectors the manufacturing shows a hike from 14.19% to 34.33%, and from the tertiary sector 'Trade, Hotels & Restaurants' shows the maximum increase from 7.76 to 16.81% of respective total GSDP during the same period.

These statistics show a declining state of agriculture in the region which is also looks evident from urban encroachment in suburban rural pockets, declining area under cultivation, and outmigration from rural areas to urban areas within and

outside the state (Deshingkar and Akter, 2009; Jain, 2010) which is a common scene in the hill districts of the state. Several other reasons such as small and fragmented landholdings, water scarcity and rainfed nature of agriculture, lack of mechanization, wildlife invasion of agricultural land, poor extension, and poor marketing etc. are also assigned for the poor state of agriculture which has serious implications for agriculture-based livelihoods in the hill regions of Uttarakhand.

The growth in manufacturing sector though a good sign for development of the state but most of such industries and units are mainly confined to cities and peri-urban plain areas, which again provides incentives for job seeking hill people to migrate to plain areas, with which again have repercussions for agriculture-based livelihoods, related knowledge base and institutions. The spectacular growth of 'Tourism, Hotels and Restaurants' is also clearly visible from increasing tourist inflow volumes of tourists to the state which was 37.73 million in 2019-20. This is welcome development for livelihoods in terms large income and employment multipliers, as also provides scope for development of Eco-tourism, Rural-Tourism, cultural-Tourism, and Agri-Tourism in rural pockets as an impact management strategy to diffusion of tourist pressure from commercial tourism destinations and through inclusion of rural areas in important tourist circuits and local Agri-products, cuisines, and artifacts in tourism menu. Secondary (Manufacturing) and Tertiary (Trade, hotels, and restaurants) sector contributes around 89 % in the economy of Uttarakhand in 2019-20, whereas the Primary sector, contributes only 11% in the GSDP of Uttarakhand which was around 40 % in the year 1993-94.

Table 1. Percent Sectorial Contribution of GSDP at Factor Cost in Uttarakhand (at Current Price, (1993-2020*RE))

S. No.	Industry	1993-94	1997-98	2001-02	2005-06	2009-10	2013-14	2017-18	2019-20*RE
1.	Agriculture	33.84	33.99	29.51	13.88	10.38	8.61	7.74	8.24
2.	Forestry & logging	4.72	3.22	3.32	5.40	3.62	2.67	1.80	1.75
3.	Fishing	0.08	0.07	0.06	0.03	0.03	0.03	0.03	0.03
4.	Mining & quarrying	1.45	0.70	1.04	1.47	0.82	2.54	1.51	1.31
	<i>Primary Sector contribution in GSDP</i>	40.10	37.97	33.92	20.78	14.85	13.86	11.08	11.33
5.	Manufacturing	14.19	12.33	9.63	15.94	22.77	39.00	37.92	34.33
6.	Construction	7.02	8.61	11.49	12.15	8.31	8.91	7.95	8.05
7.	Electricity, gas and Water supply	2.15	2.40	2.64	2.48	3.07	2.69	3.33	3.31
	<i>Secondary Sector contribution in GSDP</i>	23.36	23.34	23.77	30.57	34.15	50.59	49.20	45.70
8.	Transport, storage & communication	4.26	4.50	5.42	6.34	6.40	6.70	6.18	6.84
9.	Trade, hotels and restaurants	7.76	6.76	6.93	18.19	23.09	11.57	14.24	16.81
10.	Banking & Insurance	4.38	6.37	5.94	3.48	2.89	2.57	2.65	2.96
11.	Real estate, ownership of dwellings and business services	6.79	5.84	7.11	5.89	4.76	5.30	5.04	5.50
12.	Public administration	5.54	6.51	7.50	5.08	6.68	3.47	4.70	3.84
13.	Other services	7.82	8.71	9.42	9.66	7.18	5.93	6.92	7.01
	<i>Tertiary Sector contribution in GSDP</i>	36.54	38.69	42.31	48.65	51.00	35.54	39.73	42.97
14.	Gross State domestic product at basic price (Rs. lacs)	568557	898444	1318133	3030645	7072998	13950493	20036748	21945442
	Population ('000)	7409	7978	8418	9160	9742	10432	10959	11346

Source- Estimates of State Domestic Product of Uttarakhand (1993-94-2001-02), (1999-00-2005-06), (2004-05-2013-14), (2011-12-2020-21PE) Directorate of Economics and Statistics, (Directorate of Economics & Statistics, 2020)

Present Livelihood Scenario- A case Study of Almora District:

Demographic Profile: The demographic profile of the district is shown in Table 4; as per 2011 census, the urban population of the district is 62314 which shows an increase of 128.84% from 1961 levels; while the rural population shows a rise from 3.59 lacks to 5.60 lacks for the same period i.e., an increase of ~56% approximately. The rural population in 1961 was 92.94 % of the total and 89.99% in 2011; the sex ratio in 2011 census was 1139 per 1000 males

(Rural 1177, Urban 848), which shows a sharp rise in the urban sex ratio which was only 595 in 1961. The population density of the district in 1961 was 122 persons per km² (Rural - 115, Urban -756) which increased to 198 persons per km² (Rural - 180, Urban- 1730) in 2011. The literacy rate in 1981 was 38.06% which became 80.47 % in 2011; the male literacy being 92.86 % and female 69.93 %.

Table 2: Demographic Profile of Almora District (Census, 1961 to 2011)

Year	Number of Villages	Total persons			Population Density		Literacy rate		Sex Ratio		
		Total persons	Rural	Urban	Rural	Urban	M	F	R	U	T
1961	2404	385928	358698	27230	115.41	756.39	NA	NA	1162	595	1113
1971	2121	484263	449465	34798	144.62	966.61	NA	NA	1153	592	1099
1981	2157	558621	515393	43228	165.83	1200.78	56.3	21.41	1145	637	1095
1991	2155	610453	562718	47735	181.05	1325.97	80.76	41.24	1137	727	1098
2001	2180	632866	578361	54505	186.09	1514.03	89.19	60.53	1189	774	1145
2011	2184	622506	560192	62314	180.24	1730.94	92.86	69.93	1177	848	1139

Source – Data Compiled from District Statistical Handbook, Directorate of Economics and Statistics, Planning Department, (Government of Uttarakhand, n.d.)

Trends of Occupational Pattern: The occupational structure indirectly indicates the livelihood status of an area, and the changes in occupational pattern reveal the shift in livelihood opportunities/ trends. The occupational profile of Almora district for the period 1961 to 2011 depicted in Table 3, suggest a significant change in percent share of occupational categories, revealing a drastic decline in share of ‘Cultivators’ from 35.23% of total population in 1961 to 21.23% in 2011, ‘Total Workers’ from 44.61% to 32.30%, and ‘Marginal Workers’ from 37.52% to 15.60%; and an commendable rise in percent of ‘Non-workers’ from 18.15% to 52.10% which corresponds to an increase in number of persons dependent on the category from 70,000 to 3,25,000 persons, suggesting significant decline/ increasing gap in livelihood opportunities. The ‘Agricultural Labours’ (0.61%), and ‘Household Industry Workers’ (0.28%) comprising a very small share of total population show negligible increase in livelihood opportunities, and the ‘Other Workers’ somewhat perceptible change from 8.50% to 9.99% of total population, which corresponds to increase in livelihood opportunities in the category of persons from 32,798 to 62,201.

This category i.e. ‘Other Workers’ pertains to service sector which is the domain of urban areas, hence mainly caters to opportunities of urban centres/ areas. The statistics related to Cultivators, Total Workers, Marginal Workers suggest a negative pattern/trend with population increase, the corresponding change in percent share of these categories to total population in year 2011 vis-à-vis that of 1961, shows a dip of 47.95%. Though the dip in number of cultivators from 1961 levels is only 3841 persons, yet this is quite significant considering the fact that during that period the population of Rural Almora has witnesses an increase by nearly 56%, and family divisions in rural households would have also occurred. In ordinary circumstances, under such situations, the cultivator’s population would have increased by at least 56%, but in reality, a decline in population is observed. This trend is also evident with respect to cultivators’ population of succeeding decades i.e., years 1971, 1981, 1991, etc. Almost similar is the case for marginal and the total-workers supported population. This drop in number of cultivators, and marginal workers and total workers shows diminished opportunities and divergence from agriculture and other related livelihood activities.

The decline in the percent contribution of agriculture based rural livelihood activities as also reflected from the dip in number of cultivators, which used to cater to/ support the livelihood of 35% of the population of Almora district in 1961, is not a welcome sign, as 90% of the population of Almora still lives in villages, where agriculture is the main livelihood activity which serves the subsistence of the rural majority. In addition, divergence from and abandonment of agriculture has also implications for the agrobiodiversity of the area, the agricultural knowledge related to fertility/ nutrient management, the support systems and institutions, trade of agri-products, the associated IKS of uses of agricultural products, and their ritualistic/ cultural significance associated with the agricultural traditions. Therefore, there is an urgent need to protect agriculture and agriculture-based livelihoods systems through interventions, policies, extension and capacity building programs.

Table 3: Changing Occupational trends in Almora district

Occupational Category	Population under Occupational Categories during Years					
	1961	1971	1981	1991	2001	2011
Cultivator	135970 (35.23)	191401 (39.52)	169370 (30.32)	176084 (28.84)	146899 (23.21)	132129 (21.23)
Agriculture Labourers	2335(0.61)	4724(0.98)	3710(0.66)	1953(0.32)	1194(0.19)	4025(0.65)
Household Industry Worker	1062(0.28)	2367(0.49)	3284(0.59)	1421(0.23)	2638(0.42)	2723(0.44)

Other Workers	32798(8.50)	22468(4.64)	36702(6.57)	55769(9.14)	54654(8.64)	62201(9.99)
Total Workers	172165 (44.61)	220960 (45.63)	213066 (38.14)	235227 (38.53)	205385 (32.45)	201078 (32.30)
Marginal	143723 (37.24)	128678 (26.57)	59823 (10.71)	40209(6.59)	87918 (13.89)	97133 (15.60)
Non-Worker	70040 (18.15)	134625 (27.80)	285732 (51.15)	335017 (54.88)	339563 (53.65)	324295 (52.10)
Total population	385928	484263	558621	610453	632866	622506

Source – Data Compiled from District Statistical Handbook, Directorate of Economics and Statistics, Planning Department, (Government of Uttarakhand, n.d.)

Agriculture Situation in Almora: The Gross/Net Sown Area of Almora District mapped for period 2002-03 to 2016-17 in Fig 1 which shows a downward trend for both; almost similar pattern was observed for production and productivity of major crops of the region during this period. In the year 2002-03 district produced 24875 Mton of Potato, 42413 Mton of Wheat, and 102480 Mton of ‘Total Grains (including pulses)’ which declined to 2606 Mton of Potato, 17464 Mton of Wheat and 95641 Mton of Total grains in the district in 2015-16 (Government of Uttarakhand, n.d.)The declining trends of ‘Gross Sown’ and ‘Net Sown’ area declining production again indicates increasing divergence from and apathy towards agriculture and related livelihood opportunities.

The introduction of PDS system is also considered a reason for this divergence (Pingali et al., 2017). Discussions with farmers during field surveys reveals that due to PDS, now-a-days people take one to two crops in a year for subsistence purposes only and buy food grains from outside or from PDS shops where they can easily buy staple grains free or at highly subsidized rates.

The introduction of the PDS system in the region, also to some extent has harmed the agriculture, easy availability of food grains therein, have discouraged farmers to grow more and take in on-farm innovations for the betterment of the community and agri-landraces and biodiversity; and provided them an opportunity to migrate to plain areas for jobs. As a result of this change, the systems of conservation of seeds and crop varieties with high adaptive capacities have disrupted, causing a loss of traditional seeds and crop-biodiversity; a self-sustaining system have become dependent on outside supplies.

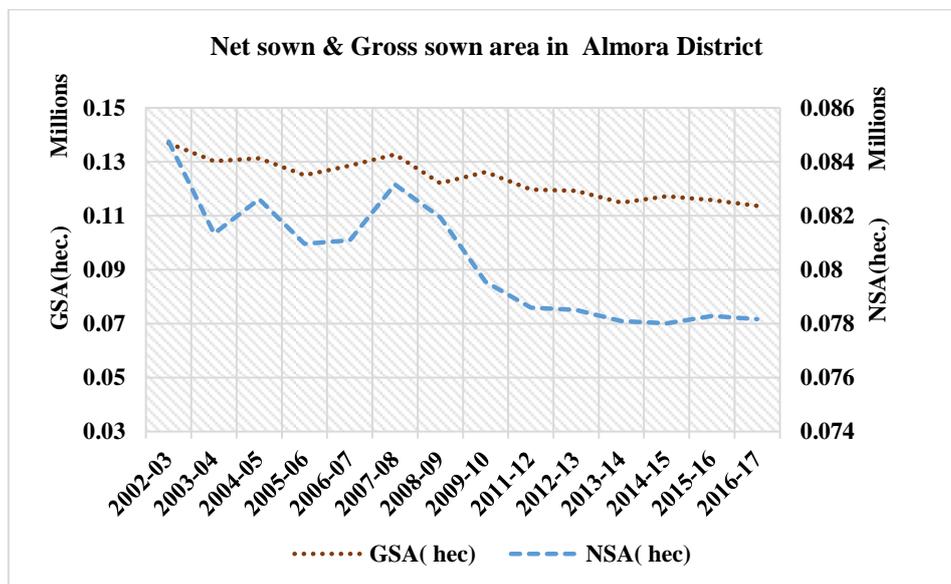


Fig. 1 Decreasing trend of Net & gross sown area in the district

The number of farmers and land area under different land-holding size classes for a period 200-01 to 2010-11, is shown in Table 4, which shows decreasing trend in in farmer numbers with time for land-holding size category of <0.5 ha, and the categories ≥ 2-4 ha, and increasing pattern for holding size of ‘0.5-1.0 ha’, the category ‘1.0-2.0 ha’ also shows an increase for the except for year 2005-06. Almost with marginal aberration for <0.5 ha class, for year 2005-05, similar trend for above categories is also evident for land area i.e., declining trend for holding categories 2-4 ha, 4-10ha, and >10 ha and increasing trend of land area for ‘0.5-1.0 ha’ land holding category.

The holding class ‘1.0-2.0 ha’ also shows an increase from year 2000-01 with aberrations. The data suggests split due to land division and outmigration in - ‘<0.5 ha ‘2-4 ha’, 4-10ha, and ‘>10 ha’ land-holding categories, and increase in number of farmers in ‘0.5-1.0 ha’ and ‘1.0-2.0 ha’ categories due to land-division/ split in ‘2-4 ha’ and higher categories.

Table 4. Number of Farmers and Area of Land-Holdings under different landholding classes

Year	Number of farmers under Land-holding size categories					
	< 0.5 ha	0.5-1.00 ha	1.00-2.00 ha	2.00-4.00 ha	4.00-10 ha	>10 ha
2000-01	59305	34968	21798	5734	501	16
2005-06	48774	36130	23148	5449	427	11
2010-11	43532	38511	22451	4570	201	3
Year	Land area under Land-holding size categories					
	< 0.5 ha	0.5-1.00 ha	1.00-2.00 ha	2.00-4.00 ha	4.00-10 ha	>10 ha
2000-01	14571	24845	29646	14610	2561	385
2005-06	12461	26924	31661	14000	2157	284
2010-11	12887	27853	30576	11578	1000	48

Source – Data Compiled from District Statistical Handbook, Directorate of Economics and Statistics, Planning Department, (Government of Uttarakhand, n.d.)

Causes of Decline of Agriculture (Problem Matrix)- Perception Analysis

The Table 5 below shows consolidated problem matrix results and rank of different problems that were identified, observed, and discussed with the community. As per the rank score, the following were identified as the top 5 major problems, that need action or policy provision for protection and revival of agriculture and sustenance of promotion of agriculture-based livelihoods.

- (1) Unavailability of labour for agricultural work due to outmigration
- (2) Unavailability of water for irrigation and wrecked canal structure; shift in rainfall patterns
- (3) Wildlife invasion of agricultural fields by wild boar & monkeys
- (4) Forest fire and fodder and feed accessibility for livestock
- (5) Loss of agricultural land due to natural calamities i.e., cloud burst, rainfall etc
- (6) Absence of farmers organization for marketing
- (7) Absence of on-farm production of quality and resilient seeds

Table 5: Accumulated Problem matrix of the agriculture sector in the area

S. N.	Problems associated with Agriculture & allied sector that relegate production efficiency and profitability in the Mountainous region of Himalaya, Almora Uttarakhand	Village-1 (Nerai) (Block-Lamgara)				Village-2 (Sauda) (Block-Bhasiyachana)				Village-3 (Binta) (Block-Dawarahat)				Village-4 (Chana) (Block-Hawalbhag)				Score	Ranking
1.	Scarcity of water for irrigation and wrecked canal infrastructure	2				4				2				3				2.75	II
2.	Land loss due to natural calamities i.e., Cloud burst/ Landslide	9				5				6				2				5.5	V
3.	Lack of organized programs, trainings, and farmer centric workshops to make Hill agriculture profitable	7				6				5				18				9	VIII
4.	Attraction of City- life	8																15.5	
5.	Unavailability of labour in farms due to out-migration	1				2				1				1				1.25	I
6.	Poor market connectivity for agriculture produce & Weak supply chain	5				6				18				18				11.75	XI
7.	Absence of on-farm production of quality and resilient seeds	4				8				18				3				8.25	VII
8.	Lack of Transport for supply of agricultural produce	3				18				18				18				14.25	
9.	Declining Farm productivity	6				18				2				18				11	X
10.	Shift in Rain fall Patterns	2				1				1				18				5.5	II
11.	Fragmented Land holding	10				18				18				18				16	
12.	Damage of fodder and feed by Forest Fire	5				7				3				5				5	IV
13.	Lack of Information about existing Govt. Plan/ schemes	18				5				5				18				11.5	
14.	Wild-life invasion of agriculture produce & farms structures	2				3				3				4				3	III
15.	Absence of/ unorganized farmers Consortium/ group for marketing	2				18				5				1				6.5	VI

	Declining herd size and quantity of					14.5	
16.	organic manure used in the farm	18	18	4	18		
17.	Fodder unavailability	18	2	4	18	10.5	IX
	Invasion of <i>Lantana camara</i> and other					12.75	
18.	weed varieties at cultivated area	11	18	18	4		

Conclusion

The declining - Net Sown and Gross Sown area, number of cultivators, declining production of important staple crops, and decreasing number of farmers and area under the medium, large, and very small land-holdings endorse to this fact that with passage of time under exogenous influences agriculture system disrupts and changes, resulting in waning interest of the people in agriculture. The declining contribution of primary sector from 40% to 11%, and particularly that of agriculture from 33.84% to 7.74% in nearly 3 decades time is very also corroborating to this fact. The degrowth of agriculture and growing apathy towards it amongst the rural population of the hill area is very alarming and a serious concern for the economic development and livelihood situation/ prospects of the state. Today, a large majority population of the hills still lives in villages, which is 90% in case of Almora district; and agriculture is only sector that provides/ can provide livelihood to a large number of people. In addition, sustaining agriculture is also has its advantages in the form of conservation of traditional landraces/ agri-biodiversity, the traditional systems and associated traditional and indigenous knowledgebase, therefore it needs to be revived and protected.

Recommendations

The results of the perception survey regarding the causes of declining state of agriculture reckon labour scarcity due to outmigration, non-availability of water for irrigation/ wrecked canal system and shift in rainfall pattern, wildlife invasion of agricultural fields, forest fire, and absence of farmers organization and product marketing system, land loss due to natural calamities, and system of development of quality seeds etc., as the major causes. Therefore, the strategies planned for revival and sustainability of hill agriculture should try to address these problems. Some recommendations in light of these problems could be as under-

- (1) Mechanization and modernization of agriculture, development of agricultural infrastructure and capital assets at community level, can help managing the labour shortage problems.
- (2) To curb outmigration, alternative livelihood opportunities, need to be created in the villages through livelihood diversification, and by promoting/ developing Eco/Agri/Cultural/Rural/Homestay Tourism in villages and by linking villages with tourist packages and local tourist circuits. Such tourism which is high in demand these days, can also be an effective counter strategy to diffuse tourist pressure from urban tourist centres which have reached the saturation point. This will help in sustaining urban tourism as also help the rural people to gain from tourism's multiplier effects.
- (3) Incentives, provisions for payments to farmers who are staying in villages and practicing agriculture can be made. This will prevent the outmigration and sustain the system. Such incentives can be linked with the farm production, this will also help in reviving the old systems and institutions, and later will help bringing innovations and enterprises, and thus transform the sector and its contribution to the economy.
- (4) Nearly 85% of hill agriculture in Uttarakhand is rainfed and water scarcity is major problem adversely affecting the agriculture productivity; the rainfall dependence also adds uncertainty to agriculture and risk of crop failure. The changed rainfall pattern under changing climate scenario (Srivastava and Bhattacharya, 2018) have further aggravated such risks as the seasonal response has changed. Therefore, to meet the water requirements for crops there is need to promote water use efficiency through application of new technologies, and promoting rainwater harvesting at village/community level, through development of a network of low-cost water harvesting structures at community. Such interventions have successfully implemented by 'Uttarakhand Seva Nidhi' an NGO of Almora in some villages in Kumaun Himalaya, under the National Mission for Himalayan Studies (NMHS) funded project; such models can be upscaled and replicated in other areas.
- (5) The abandonment of agriculture has resulted in soil compaction which seems to aggravated the run-off flows (McKenzie H. Ross, 2010) and reduced below ground percolation of water; practising agriculture at full capacity/ scale can increase water percolation in ploughed field. The vegetation cover can also improve interception and impact effect of rain and thus can reduce the damage effect of natural calamities of moderate to mild scale pertaining to flash floods caused by extreme rainfall. Therefore, there is need to create incentives for agriculture, which besides safeguarding the livelihood interests of people also reduce the threats of disaster including that of forest fire; the large number of people staying in villages will also help developing better community-based disaster management system. More rights to people in forests, and payment mechanisms for ecosystem services of forests will serve both.
- (6) The farmers provide the surplus of fruit and vegetable crops for sale in local and regional markets, and interstate sale points. This supply of their produce is managed through middleman, and regional sale agent, who dictate the price of the produce. Under this system the farmers do not have any elbow room for the bargains, and do not get the fair share in the profits. The middleman/ agents also provide them planting, and packaging material and high interest loans for their farm operations through an age-old system, where farmers own huge debt to them, which refrains them from commanding the prices, and securing due profits. Therefore, there is a need to develop

and strengthen farmers organization, and a system of value chain managed by farmers; for farm operations a provision of soft loans to farmers should be made.

- (7) The development of quality seeds of agricultural crops is a very important and neglected subject. The introduction of HYV and Hybrid varieties have resulted in loss of traditional seeds and the culture of developing such seeds, this system also suffered due to poor extension. Therefore, there is a need to revive such systems and practices, which can protect the traditional crop diversity and the livelihood interests of the people.

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