



Associative Assessment of Agriculture Sustainability, Environment and Poverty in the Hill Rural Areas of Uttarakhand: a Study of Pauri District of Uttarakhand

KEYWORDS

Deprivation, Sustainability, Climate change, poverty, organic farming

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ABSTRACT *In the present study the hill rural regions of Uttarakhand absorbs the aspect of 'Area Deprivation'. The Hill areas of Uttarakhand due to poor geographical settings and lack of infrastructure facilities present tough living and working condition for those residing in these hilly areas. This has always led to the problem of lack of Employment opportunities in these regions in secondary and tertiary sector which has led the inhabitants of these regions to be economically deprived or to migrate from these regions which has further degraded the sustainability of these regions. Agriculture and the allied activities are the only source of living to small extent and a source of subsistence to a large extent for the residents of these backward areas. But due various environment issues like climate change, natural disasters; agriculture sustainability is in danger which further aggravates the problems of poverty in these regions. The present study examines this association between the agriculture, poverty and environment existing in these regions along with its present status and potential it carries to develop these regions.*

The Background Scenario

The Uttarakhand economy is designated as the 'money order economy' due to the higher percentage of migration from the rural areas of the state or to the urban centres of other states. The push migration from these regions is mainly attributed to the poor development status of these regions which is reflected in the lack of basic infrastructural facilities of health, education, employment etc. The natural and geographical settings of these regions have indirectly enacted in path of the growth of employment opportunities in these regions as they are not conducive for industrial development. This has always led to the problem of lack of employment opportunities in these regions which is further been accentuated by the poor infrastructural development of these regions. The hill rural regions of Uttarakhand are poor in every basic facility which has failed to help in making its inhabitants life and living easy. Majority of villages have still the *kuccha* road, they have water problems, irrigation system is poor and villagers have to depend on the far areas for the health facilities. The other major problem, with which, these regions of the state has to deal every year is of uncertain extreme weather conditions and the natural havoc it causes. The natural disasters not only adversely affect the agriculture development but also directly affect the normal living and working conditions of the inhabitants of these regions. All these adversities have led to far spread absolute poverty and to small extent relative poverty when we consider it within these areas but it is much significant when compared to urban areas of the district or of the state. The basic infrastructure needed for making the health centers and there service accessibility is a major challenge in comparison to delivering education, income generation and other related facilities in these regions. The gravity of the problem increases when these facilities have to be delivered to the inhabitants of the most inaccessible areas which have always remained a challenge for the authorities.

The Problem and three Development Agents

The Problem of these areas and its inhabitants lies in the existence of 'Area deprivation'. The area deprivation in the present sense is not only the lack of economic re-

sources but also the lack of infrastructural development and presence of environment susceptibility of these areas. The lack of economic resources are due to the lack of development of secondary and tertiary sectors in these areas which could be accepted to an extent as these areas lack the favorable geographical and infrastructural environment and facilities which could lead to their development. Among these adverse conditions one may consider the role of primary sector as prominent in the economic empowerment of these regions. But the failure of agriculture in these regions has aggravated the problems of the inhabitants of these regions further acting upon the 'economic deprivation' of these regions. Hence the solution for the development of these regions perhaps shoulders upon the agriculture and its development, so one of the major agents of development, of these areas could be 'Agriculture' if brought in the path of development.

As agriculture activities and their sustainability largely depends on the environmental aspects the other agent which could indirectly assist as agents in the development of agriculture in these areas could be 'environment'. The changing environment prominently exhibited in the climate change and huge vulnerability of the farmers of these regions to it has acted as a hindrance in the path of agriculture development. Due to the poor environmental aspects and hence poor economic development of these regions and their inhabitants has eventually magnified the problem of economic deprivation in these backwards regions. Economic deprivation of the inhabitants of these regions has led to force the farmers of these regions to either over exploit their agriculture lands or to move towards unsustainable agriculture practices and in extreme cases has led to abandon their agricultural lands. This has not only negatively affected the agriculture productivity, soil fertility but also has led to unsustainable development of agriculture in these regions. In this process of following unsustainable agriculture practices and land abandonment the status of agriculture has rapidly degraded thus enhancing the economic deprivation of the inhabitants of these already deprived regions. Hence the main agent in this unsustainable development of agriculture is economic deprivation which

could be designated as the third vital agent which directly and indirectly leads to the hamper the development of the agriculture and overall the development of these regions and its inhabitants.

Hence the three prominent agents which are acting upon one other to degrade the economic development process in these regions are:

1. Agriculture
2. Environment, and
3. Economic Deprivation (Existence of Poverty)

All the three agents build a vicious cycle of deprivation in these areas which is necessary to be ended to develop these regions and to eradicate its major problems like poverty, underdevelopment and migration.

Associative analysis of all the three agents

1. Agriculture and Poverty

Agriculture is primary source of earning and livelihood in the hill rural areas of Uttarakhand but it is quite opposing fact that underdevelopment of agriculture has magnified the poverty levels of the inhabitants of these regions and simultaneously the existence of poverty in these areas has led to poor development of agriculture in these regions. To judge the viability of this correlation between these two agents the study has examined the status of agriculture among the BPL households in the hill rural regions of the Pauri Garhwal district of Uttarakhand.

Agriculture is not a profitable means of employment in this hilly district due to its uneven geographical conditions, small terraced fields and non-availability of proper irrigation facilities. The Nayar (the main river system of the district) catchments are richly endowed with various natural resources viz. Soil, Water, Minerals, Rocks, Forests and a Scenic Landscape. It is still economically under developed. The present form and level of agro economy of the area is considerably poor. In the district, the agricultural land is in the form of narrow terraces and scattered holdings except in the case of river valleys and in most cases uneconomical for cultivation. The cultivated land is a mostly non-irrigated, terraced field with undulating slopes, with extreme climatic variations and abrupt changes in altitudes. Due to these variations the cropping pattern changes with the altitude and the climatic conditions. Wheat and Barley are the main 'Rabi' crops while Rice, Kodo, Sanva are main 'Kharif' crops of the district. Urad, Arhar are the main pulses grown in the district while Mustard and Soybean dominate in oil seeds. The agricultural land of the district is much suitable for fruit and vegetable production in comparison of agricultural production. Vegetables can be produced around the year in the district due to climatic differences of hilly and valley area viz. 'peas', 'cauliflower' etc. is produced in valleys during winter while in hilly areas during summer. The animal husbandry and cattle breeding is an integral part in the district.

Although agriculture is under developed in the district but the present study has revealed that agriculture and allied activities are the major sources of employment generation among the BPL household members of the hill rural regions of Pauri Garhwal district of Uttarakhand. 47.4 percent of the workers are engaged in agriculture and allied activities in these regions of which the female participation is greater than that of the males. Keeping this fact in con-

sideration it is important to analyze the role and importance of agriculture and allied activities for the BPL households in this district.

Utilization of Agricultural produce

For the purpose of studying the purpose for which food is produced and livestock is raised; agriculture activities in the study are divided into two groups. These two are: subsistence agriculture and commercial agriculture.

Subsistence agriculture: This form of agriculture can be defined as production of a certain amount of food that is enough to sustain the family producing food.

Commercial agriculture: The practice of producing crops and raising livestock for the purpose of selling the end products in the market is categorized under commercial agriculture.

The study shows that 75.2% of the BPL households utilize agricultural produce for self consumption only, while only 24.8% of the households use it for both commercial purposes and for self consumption. This shows that subsistence farming is the prevalent form of agriculture among the BPL households and agriculture for commercial purpose is very marginally practiced among them. This suggests that agriculture although is practiced by the majority of the BPL households in these areas but is merely a source of living and subsistence for them.

Nature of Agriculture and allied activities

The study has shows that agriculture has failed to act as major source of earning for the BPL households. But still agriculture occupies a significant role for these households as it acts as a source of living and subsistence for them. Keeping in perspective the importance of agriculture and allied activities for these BPL households it is important to study the agriculture activities carried out by them. The table given bellow depicts the distribution of agriculture activities carried out by the BPL households of the Pauri Garhwal district.

Table No: 1 Distribution of agriculture production among BPL households In Pauri district

S.No	Name of Agriculture produce	No. of BPL households (producing main crops)	Utilization of agriculture produce	
			Commercial and Subsistence	Subsistence
1	Cereals	319	90 (28.2%)	229 (71.8%)
	(a) Rice	47 (14.7%)	23	24
	(b) Wheat	76 (23.8%)	58	18
	(c) Maize	09 (2.8%)	01	08
	(d) Mandawa	187 (58.7%)	08	179
2	Pulses	21	18 (85.7%)	03 (14.3%)
	(a) Split Black Gram	18 (85.7%)	15	3
	(b) Red Lentil	2 (9.6%)	2	0
	(c) Split Green Gram	1 (4.7%)	1	0
3	Other crops	268	31 (11.6%)	237 (88.4%)
	(a) vegetables	268	31	237

Source: Field Survey, ICSSR, R.P- Nov 2013 to Sept, 2014

The data extracted from the field study depicts that majority of the BPL households are using their agriculture land for producing cereals and vegetables. Among the differ-

ent cereal produced "Manduwa" is the only cereal which is largely produced by these households. "Manduwa" produced is mainly for self consumption while Rice and wheat are produced for both subsistence and for the commercial purpose. Pulses are produced by very small number of BPL households. Vegetables are also produced by majority of the BPL households which is generally used for self consumption by them. The greater use of agriculture production for self consumption reflects upon the fact that the food they receive from BPL status quota is insufficient for meeting their household demand.

Average food sufficiency provided by agriculture production

To analyze the level of food sufficiency provided by the agricultural produce to these BPL households the study investigated on the duration (in months) for which the domestic produce is utilized by the households for subsistence.

Table No: 2 Average food sufficiency provided by domestic agriculture produce

S.No	Pauri District (15 Blocks)	Average food sufficiency of domestic agriculture produce					
		Zero month	Less than one month	One month to two months	Two months to four months	Four months to Eight months	More than Eight months
Total (No. of households)		121 (27.4%)	98 (22.2%)	137 (31.1%)	84 (19.1%)	01 (0.2%)	--

Source: Field Survey, ICSSR, R.P- Nov 2013 to Sept, 2014

The above table depicting the average food sufficiency period of the BPL households domestic agriculture produce shows that in majority of cases the domestic agriculture produce is only sufficient to meet up to two months of the requirements of the members of these households. Only in case of 19.1 households the food is sufficient to meet above two months to four months demand of the members of the BPL households in these areas. A staggering 27.4 percent of the households have further revealed that the agriculture output they produce is not even sufficient to meet their households members one month food requirements. This indicates the poor status of agriculture in terms of meeting the food requirements of the BPL households in these areas.

The study thus shows that agriculture although having enough potential has failed in not even providing income earning opportunities to the poor residents of these areas but also even has failed to meet their subsistence level of demand. This status of agriculture has aggravated the problems of inhabitants of these regions which are already trapped in the poverty. This failure of agriculture has further forced the inhabitants of these regions to either migrate from these regions or to shift towards wage employment in other sectors.

Impact of decreasing agriculture activities and participation

The failure of agriculture to either act as income generating source or to act as mere source of subsistence and has resulted in the following activities in these regions:

1. Shift from agriculture activities to other sources of in-

come

2. Over and undue exploitation of agriculture land

The failure of agriculture has forced the farmers to move towards other sources of income among which major is the wage employment. This shift of farmers from agriculture activities is depicted in the decreasing participation of poor households in the agriculture activities as depicted in the table given below.

Table No: 3 Number of household members engaged in living and income generating activities

Field of employment	Number of BPL household members		
	Male	Female	Total
Agriculture and allied activities	297 (33.6%)	593 (59.8%)	890 (47.4%)
Industry	-	-	-
Private Sector	62 (7.0%)	21 (2.1%)	83 (4.4%)
Self Employment (Business)	138 (15.6%)	63 (6.3%)	201 (10.7%)
Wage employment (non-agriculture)	387 (43.8%)	316(31.8%)	703 (37.5%)
Total	884	993	1877

Source: Field Survey, ICSSR, R.P- Nov 2013 to Sept, 2014

This decrease in participation is more concerning on the basis of the finding that all the households have agriculture land and they have full ownership of them.

This shift of the poor farmers from agriculture to other activities and poor productivity of agriculture has resulted in-

1. Increasing bareness of agriculture land
2. Decrease in size of operational land holdings
3. Leasing of land to immigrants
4. Shift from organic farming to conventional farming methods for increasing production

All these after effects generated due to shift of local farmers from agriculture to other sources of income and employment generation are not only decreasing the status of agriculture but also drastically reducing the agriculture sustainability in these areas. Decrease in size of operational land holdings and increasing percentage of barren land has resulted in failure of agriculture to sustain the livelihood of the residents of these areas. The other aspect that is, the increase in leasing of agriculture land to immigrants from other states and country like Nepal has rapidly decreased the sustainability of agriculture land in these areas as the agriculture practices adopted by these immigrants is unsustainable and in long term will not only decrease the fertility of these lands but will also enhance the danger of increasing land barrenness. Amidst all these problems the poor production and productivity of agriculture has forced the inhabitants of these regions to shift towards conventional farming methods from organic farming methods which has resulted in poor sustainability of agriculture in these regions.

Major sustainability problems associated with agriculture in hill areas

The study highlights the three major issues which are decreasing the sustainability of agriculture in these regions. All the three issues are correlated with each other and further influenced by many other factors which are discussed in brief.

1. Increasing trend of shift from organic to conventional farming
2. Loss of crop diversity- mainly due to unscientific usage by immigrants
3. The higher use of agrochemicals contributed in the
 - (a) Reduction in natural fertility of the soil
 - (b) Poisoning the food with high toxic pesticides residues
 - (c) Destruction of soil structure, aeration and water holding capacity
 - (d) Indiscriminate killing of helpful insects, microorganisms and predators that naturally check excess crop damage by insects and pests

Poverty and poor agriculture production

The majority of these residents of the hill rural regions are economically deprived which has a negative effect on the agriculture productivity in these areas. In the study it has been revealed that majority of the farmers use the food grains as seeds which they get through BPL quota. They are forced to use these grains because the market price of the hybrid seeds is too high and they largely fail to afford it. Thus use of poor quality of grains for agriculture production has also resulted in the continuous fall in the agriculture productivity in these regions.

Associative analysis of Environment, poverty and Agriculture

All the agriculture problems do not have their all together origin in issues of poverty but the rapid changes in the environment and the problems created by environmental conditions mainly in these areas with harsh geographical regions have their equal contribution. These regions are more susceptible to climate change due to the following reasons:

- Poor geographical settings of the agricultural lands in these areas; majority of the farming in these region are carried out in terraced farms which are highly prone to the disastrous effects of heavy rain spells which not only destroys the yields but also erodes away the top fertile soil from these agricultural lands.
- Small holdings, poor coping mechanisms and low penetration of mechanisms and low penetration of risk management products are the other factors which increases the vulnerability of the agriculture towards climate changes in these hill rural regions Reductions in agriculture production as a result of climate change is expected to be more prominent for rain fed crops (as opposed to irrigated crops) and under limited water supply situations, because there are no coping mechanisms for rainfall variability. Further the agriculture in these regions is largely depended on the rainfall as the irrigation facilities are almost absent or very poorly developed. This increases their vulnerability to the climate change.

- The increasing pattern of unsustainable farming methods due to poor awareness about agriculture production methods and increasing participation of immigrants in the agriculture activities which follows the highly exploitive methods of farming with increased use of unsustainable farming methods has resulted in increasing the vulnerability of agriculture land and production to climate change.

The impact of climate change has been prominent on the agriculture production and productivity and hence forced the farmers to move to reduce the level of agriculture production which is noticed in the decrease in the operational land holdings and in increasing land barrenness in these areas. This has degraded the agriculture status and further has enhanced the vulnerability of agriculture land and its productivity to the climate change in these areas. The failure of agriculture in these areas due to increasing poverty and climate change has simultaneously worked on each other as a result the gravity of impact of each factor has become more and more prominent thus making the life of the residents of these areas more vulnerable.

Conclusion and suggestions

The study here thus concludes that all three factor agents, Poverty, Environment and Agriculture are interlinked with each other in these hill rural areas of Uttarakhand. All the three factors affect each other making them more and more vulnerable to each other. In turn these factors lead to poor agriculture development of these areas and worsen the income opportunities and agriculture development in these areas. The direct impact of this is on the poor economic status of the inhabitants of these areas which either leads to their forced migration from these areas or to shift them towards other forms of low paid employment available in these areas. All these factors are leading to the poor development of these areas and increasing the sustainability of these areas which is threatened due to continuously increasing migration from these regions. To overcome the effects of these three interlinked agents over each other it is important to deal with all the three issues separately as the solution of all the problems is also hidden in the existing linkage between them. To alleviate the effect of the climate change following policy prescriptions could be implemented in these areas. Promotion of water conservation and irrigation techniques in these areas could be major factor which could assist in mitigating the effect of climate change on agriculture yield in these hill rural areas. Majority of the water sources in these areas are the natural streams, water from these streams get wasted, to make its adequate use its conservation should be done scientifically for utilizing it for irrigation. A huge amount of canals in these areas has gone dry or dysfunctional due to poor maintenance and other reasons. Government should identify such canals and work on their restoration. MNRGA activities should be targeted towards restoration of such canals. the agricultural land of the district is much suitable for fruit and vegetable production in comparison of agricultural production. Further as the production of fruits like apples requires less moisture than vegetables, horticulture activities should be promoted in these regions. Further for such promotion agro processing units and agro industries should be established nearby these areas.

Further changing land-use practices such as the location of crop and livestock production, rotating or shifting production between crops and livestock, shifting production away from marginal areas, altering the intensity of fertilizer and pesticide application as well as capital and labour inputs can help reduce risks from climate change in farm produc-

tion. Development of new crop varieties with higher yield potential and resistance to multiple stresses (drought, flooding) will be the key to maintain agricultural production stability. Diversification of crop and livestock varieties, including replacement of plant types, cultivars, hybrids, and animal breeds with new varieties intended for higher drought or heat tolerance, could lead to decrease the effect of climate change. To stop the shift of the farmers from organic farming methods to the conventional farming methods it is important to increase the awareness of the farmers regarding the importance and benefits of organic farming methods in these areas. Irrigation facilities should be developed along with developing the water conservation methods in these regions. To negate the impact of poverty on agriculture it is important to supply the hybrid and seeds at lower prices to the farmers which could mitigate the effect of climate change of these regions further it should be ensured that these seeds are available to the farmers at PDS shops to increase their accessibility. All these measures if implemented could help in breaking the vicious circle of under development of these areas created by the working of these three agents simultaneously. The development of agriculture through mitigating the impact of these factors will not only assist in improving the living and livelihood opportunities of the inhabitants of these regions but in the long way will also lead to the development of these backward and deprived regions of state.

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