

## CROPPING PATTERN AND ECONOMICS OF CEREALS PRODUCTION IN DIVERSE SEASONS OF UTTARAKHAND HILLS

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**Abstract:** This study was aimed at identifying cropping pattern in Uttarakhand state and analyzing cost, return and profitability of cereals in different seasons. The study is based on the both primary and secondary sources and has made use of the farm level cross-sectional data collected through multistage random sampling technique from 200 sample farmers belonging to different hill altitudes. To estimate cost major inputs like labor, farmyard manure, fertilizer, seeds, animal feed etc were identified and valued at the prevailing market rates. Returns were estimated by multiplying quantities produced of particular crop and current market prices. Results indicated a cropping intensity of 188% and the cereal crops accounted for around 70% of the gross cropped area. Wheat emerged as the main food grain crop in the study area with its percentage share of 26.98% in the gross cropped area, while paddy (24.21%) was the second major cereal crop in the study area. The cost of cultivation of cereals summer season (₹ 11704/acre) was slightly less than that of cereals in winter season (₹ 11866/acre). Per acre net return from cereals was found to be higher for winter season (₹ 11237.7/acre) when compared to wheat summer season (₹ 8420.37/acre).

**Keywords:** Cereals, Cropping pattern, Cost of cultivation, Net returns, Seasons

### INTRODUCTION

The cropping pattern in India has undergone considerable changes over time. As the cultivated area remains relatively constant, the increase in demand for food because of increased population and urbanization has necessitated crop intensification and substitution of food crops with commercial crops. During 2011-12, there was a record for the production of food grains in India at 259.32 million tonnes, of which 131.27 million tonnes was during Kharif season and 128.05 million tonnes during the Rabi season. Of the total food grains production, the production of cereals was 242.23 million tonnes and pulses 17.09 million tonnes. A number of studies reveal that improved production of agricultural commodities through green revolution resulted in lower incidences of rural poverty (Ahluwalia, 1978; Narayanamoorthy, 2004; Hussain and Hanjra, 2003; 2004), wage rate improvements and in creating employment opportunities in the rural areas mainly for the landless labourers (Saleth, *et al.*, 2003). Despite all these attainments, the farm sector in India is not free from many upsetting facets. Farmers' suicides, indebtedness, poor returns over cost of cultivation, non-remunerative prices for crops and crop failures etc. are the prominent features of India's agriculture today (Pushpa *et al.*, 2017). Why this is happening in India still remains a concern. Some studies have observed that stagnation in real income, higher cost of cultivation through relatively higher rise in input prices than the prices of the agricultural produce could be the reasons for farmers suicides (Kalamkar

and Narayanamoorthy, 2003; Narayanamoorthy 2006; Deshpande and Arora, 2010; Sainath, 2010).

Hilly states in particular, confront multiple risks and uncertainty due to undulated topography, scattered land holdings, low mechanization, soil erosion and extreme weather conditions, etc. Returns from crop cultivation are vital not only for the survival of the farmers but also to facilitate reinvestment in agriculture. The Situation Analysis Study of Indian Farmers conducted by the National Sample Survey Organization (NSSO) in 2006 has revealed that about 27 per cent of the farmers do not like farming because of its less profitability; and if a chance is given, nearly 40 per cent farmers would prefer to take up livelihood activities other than farming (Kumar *et al.*, 2006).

Jammu and Kashmir, Himanchal Pradesh and Uttarakhand are the three major northern hilly states of India. Out of the three hilly states Uttarkhand was purposively selected for the study due to following reasons:

- Uttarakhand have higher rural (11.62per cent) and urban (10.48per cent) below poverty line (BPL) percentage (RBI, 2012).
- The state performs worse (6<sup>th</sup> rank) than Himanchal Pradesh (8<sup>th</sup> rank) and Jammu and Kashmir (10<sup>th</sup> rank) in the development disability index (NIPFP report, 2013).

The economy of Uttarakhand is predominantly agrarian where only 14 percent of the total land is under cultivation and about 65 percent of population depends on agriculture for their livelihood. State's land holding pattern is also not promising, nearly 75 percent population has marginal

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land holding (Less than 1 hectare). Furthermore, cropping pattern in the state is dominated by traditional and low yielding crops leading to continued vicious cycle of low production. Being a state with diverse agro-climatic endowments, conditions under which agriculture is carried out differ remarkably across areas. Broadly the plains and hills present different scenario for agriculture in Uttarakhand. However, the development has predominantly been in the plain areas and the hilly areas have been left behind. The hilly regions are lacking behind in terms of infrastructure, i.e. electricity, roads and irrigation facilities. Not many studies have detailed analysis of the profitability of different crops in relation to the cost of cultivation. Therefore, an attempt has been made in this study to find out the cost of cultivation and profitability of major cereal crops in hilly region of country.

## MATERIAL AND METHODS

A Multistage random sampling technique was used for the study. In the first stage two districts, viz., Champawat and Nainital were chosen from the state randomly. Champawat district consists of four developmental blocks out of which two blocks namely; Pati and Lohaghat were selected in the second stage, while two blocks i.e. Okhalkanda and Ramgarh were chosen from eight development blocks of Nainital district at random. At the final stage two villages clusters each from low hills and high hills were selected randomly from each block. A complete list of all the farmers in each selected village was prepared and twenty five farmers from each village were selected randomly. Therefore, the study was based on the findings from 200 sample farmers selected in the study area.

### Database

The required primary data were collected from selected farmers using pre-structured schedule through personal interviewing method for the agricultural year 2017-18. Information related to various socio-economic parameters of the households like, caste and religion, size and composition of family, education level, principal and subsidiary occupations, land holding, livestock possession, asset possession, income and expenditure pattern, employment pattern and earning from different sources, consumption pattern etc., were collected

from the primary sources. Secondary data was also collected from different government offices like District Block Development Offices, Office of Chief Agricultural Officer of Nainital and Champawat districts, District Statistical Offices, as well as from different government publications and websites. Besides, some basic information was also collected from different journals and publications.

### Analytical Framework

Farm income was obtained by broadly estimating costs and returns from various crop and livestock enterprises as a whole. To get the net income, total farm income was subtracted from total cost.

Cost of cultivation includes operational costs, material costs and other costs in crop production. In operational costs, the cost of hiring human labour, machine power, bullock charges have been estimated by the prevailing rate at that particular period of time in the study area. Hired labour charge at the actual wage paid in cash and other kind of payments were also converted into monetary terms at the existing price. Imputed value of the family labour was also calculated using the prevailing wage rate in the study area. In case of bullock, tractor and other machinery and hiring charges were applied to these as the cost for those who don't own them, whereas the cost of fuel, repairing and maintenance cost were calculated for those who own them. In case of material costs; cost of seeds, manure, chemicals, fertilizers irrigation charges were calculated at prevailing price at the time of application per acre basis for selected farmers. Owned seed was priced as the prevailing seed price in the study area. Rental value of the land prevailed in the study area during study period was taken.

On the other hand, returns were estimated by multiplying quantities produced of particular crop and prevailing market prices.

## RESULTS AND DISCUSSION

### Occupational structure of households

In determining the main and subsidiary occupations, the source from which the household earned the highest income was considered as the main occupation and rest others were considered as subsidiary occupations. Details about the main and subsidiary occupations of the respondents are presented in Table 1.

**Table 1.** Occupational distribution of households

Average number of livelihood activities per HH	3.45		
Livelihood activities	Households		
	Total	Main	Subsidiary
Agriculture	200 (100.00)	31 (15.50)	169 (84.50)
Livestock Rearing	197 (98.50)	1 (0.50)	196 (98.00)

Agriculture + Livestock Rearing	45 (22.50)		
Agricultural laborer	14 (7.00)	10 (5.00)	4 (2.00)
Govt. Job	54 (27.50)	49 (24.50)	5 (3.50)
Private Job	58 (29.00)	41 (20.50)	17 (7.50)
Self Employed/Business	64 (32.00)	52 (26.00)	12 (7.50)
Pension	69 (34.50)	16 (8.00)	53 (26.50)
<b>Gender-wise participation in farming Activity</b>			
Male	114 (57.00)		
Female	200 (100.00)		
<b>Average age of individuals who are engaged (Yrs)</b>			
In Farming	43.41		
In Other livelihood activities	34.69		

**Note:** Figures in parentheses indicate per cent to total households.

It is evident from the table that despite having 100 per cent participation of households in agriculture, earning wise it was main occupation only for 15.50 per cent of the households while for 84.50 per cent households it was observed as subsidiary occupation. It is important to notice that livestock rearing was only the subsidiary occupation for almost all households. Only 22.5 per cent households pursued agriculture + livestock occupation solely. Average number of livelihood activities per household was 3.45 in the study area. Crop production activity was undertaken by each and every sample farm households with the variation in the household income shared by crop production. Livestock activities were also common as most of the sample farm households (98 %) were found to be engaged in livestock rearing.

Self employment in the form of shop keeping, account keeping and driving etc. were pursued by most of the households and formed main occupation for around 26 per cent households while was subsidiary occupation for 7.5 per cent of the same. Other predominant occupations for households were private salaried jobs particularly in factories (main 20.5 % and subsidiary 7.5 %), and government services (main 24.5 % and subsidiary 3.5%) etc. Construction workers, aaganwadi workers, bhojan matas, street hawkers, housemaids were the common type of occupations prevalent among sample households. About 35 per cent households received pension of which for 8 per cent of households it was main source of livelihood.

It is very interesting to note that female participated predominantly (100 %) in agriculture while male participation was considerably low i.e. only 57 per cent (Table 1). Reason might be less productive agriculture made them to move out and find other

sources of earning while major family responsibilities and social constraints made women stay at home and continue farming. The average age of individuals who were engaged in agriculture was 43.41 years while those individuals who were engaged in other livelihood activities it was 34.69 years. It shows that there may be instances of disinterest of the younger class of population in agriculture owing to many reasons like lesser returns from agriculture, imitation of urban culture etc.

#### **Cropping pattern followed by farm households**

Cropping pattern refers to the yearly sequence and spatial arrangement of crops or of crops and fallow on the given area. It can be said the gross cropped area under various crops during an agricultural year. It is a dynamic concept as none cropping pattern can be said to be ideal forever in a particular region. It changes with space and time to meet farm household's requirements and is governed largely by the physical as well as cultural and technological factors. In the present sub section the overall cropping pattern followed by different farm households in the study region is outlined. Table 2 elicits the details of cropping pattern in the study area.

It is evident from the table that cereals occupied the major share of land both in summer and winter seasons. This share was about 34 per cent and 31 per cent of gross cropped area respectively. In summer season paddy was cultivated in 24.21 per cent and coarse cereals (millets) were grown in 9.99 per cent of the gross cropped land. The major cereals grown in winter season were wheat and ragi of which wheat occupied 26.98 per cent of gross cropped area. The share of coarse cereals was very less i.e. 3.84 per cent in winter season.

**Table 2.** Cropping pattern in the study area

Crop	Area in Acre (acre)	Percentage
<b>Kharif Season (Summer)</b>		
<b>Cereals</b>	<b>4.45 (0.22)</b>	<b>34.20</b>
• Paddy	3.15 (0.16)	24.21
• Coarse Cereals (Sorghum, pearl Millet)	1.30 (0.07)	9.99
<b>Pulses</b>	<b>1.58 (0.08)</b>	<b>12.14</b>
• Horsegram	0.75 (0.04)	5.76
• Soybean (Black)	0.45 (0.02)	3.46
• Rajma	0.38 (0.02)	2.92
<b>Vegetables</b>	<b>0.88 (0.04)</b>	<b>6.76</b>
• Chilli	0.70 (0.03)	5.38
• Pumpkin	0.08 (0.00)	0.61
• Turmeric	0.10 (0.01)	0.77
<b>Total cropped area</b>	<b>6.91 (0.35)</b>	
<b>Rabi + Zaid Season (Winter)</b>		
<b>Cereals</b>	<b>4.01 (0.20)</b>	<b>30.82</b>
• Wheat	3.51 (0.18)	26.98
• Coarse Cereals (Ragi, Barley)	0.50 (0.02)	3.84
<b>Pulses</b>	<b>1.21 (0.06)</b>	<b>9.30</b>
• Lentils	0.75 (0.04)	5.76
• Gram	0.46 (0.02)	3.54
<b>Vegetables</b>	<b>0.88 (0.04)</b>	<b>6.76</b>
• Potato	0.36 ((0.02)	2.77
• Onion	0.31 (0.01)	2.38
• Radish	0.21 (0.01)	1.61
Fallow	<b>0.51 (0.02)</b>	<b>3.92</b>
<b>Total cropped area</b>	<b>6.10 (0.30)</b>	
<b>Gross cropped area</b>	<b>13.01 (0.65)</b>	<b>100</b>
<b>Cropping Intensity</b>	<b>188.28%</b>	

Figures in parentheses indicate values in hectare (1 acre=0.05 acre)

Pulses occupied around 12 per cent and 9 percent of gross cropped area in summer and winter season respectively. Among pulses horsegram, black soybean and rajma were major pulses grown in summer season and covered 5.76 per cent, 3.46 per cent and 2.92 per cent of gross cropped land, while in

winter season lentils and gram occupied 5.76 and 3.54 per cent of the gross cropped area respectively. Table further reveals that the share of vegetables remained same in both the seasons and was grown in 6.76 per cent of the gross cropped land. In summer season chilli occupied the major share of land (5.38

%) among vegetables followed by turmeric (0.77 %) and pumpkin (0.61 %). In winter season potato, onion and radish were major types of vegetables grown and occupied 2.77 per cent, 2.38 per cent and 1.61 per cent of gross cropped land respectively.

Around 4 per cent land was left as fallow land in winter season thus giving the average gross cropped area of 0.65 acres in the study area in one agriculture year. Cropping intensity was observed to be high i.e. 188.28 per cent in the study area.

#### Economics of cereal production in the study area

Table 3 depicts cost of cultivation and returns from the cereal crops produced in the study area. For estimating the cost major inputs were identified under three broad categories viz., labour cost, material cost and rental value of owned land. Labor cost was further divided into three subgroups namely; family labour, hired labour and bullock labour. Material cost was also divided into two

subgroups i.e. seed cost and cost of manures, fertilizers and plant protection chemicals taken together. Owned land was valued at prevailing rental rates of agricultural land in the study area.

Table 3 reveals that the average imputed cost of family labour incurred on different operations involved in cereal production was 42.51 per cent and 27.81 per cent in summer and winter season respectively. As paddy is grown in kharif/summer season, more labour is required for various additional operations involved in paddy cultivation like transplanting, puddling, land preparation etc in comparison to wheat, which is grown in winter season. The results were in consonance of the study conducted by Singh *et al.* (2013) who reported that share of human labour in gross cost was 45 per cent in case of inbred variety of rice production in Uttarakhand.

**Table 3.** Cost of cultivation & returns from various Crops (Rs/Acre)

Particulars	Kharif Season (Summer)	Rabi + Zaid Season (Winter)
<b>Family</b>	Cereals	Cereals
<b>Labor Cost</b>		
Family	4975.60 (42.51)	3300.40 (27.81)
Hired	104.60 (0.89)	157.20 (1.32)
Bullock	1930.00 (16.49)	2362.40 (19.91)
<b>Total labour cost</b>	<b>7010.20 (59.89)</b>	<b>5820.00 (49.04)</b>
<b>Materials Cost</b>		
Seed	618.20 (5.28)	872.20 (22.94)
Fertilizers + Manure+ PPC	2076.00 (17.74)	3173.60 (26.74)
<b>Total material cost</b>	<b>2694.20 (23.02)</b>	<b>4045.80 (34.10)</b>
<b>Rental value of owned land</b>	<b>2000 (17.08)</b>	<b>2000 (16.85)</b>
<b>Total Cost</b>	<b>11704.40 (100)</b>	<b>11865.8 (100)</b>
Yield (Kg/Acre)	920.20	1169.80
Price/ kg	21.87	19.75
<b>Total Returns</b>	<b>20124.77</b>	<b>23103.5</b>
<b>Net Returns</b>	<b>8420.37</b>	<b>11237.7</b>

It was further observed from the table that average expenditure incurred on bullock labour was around 16 per cent and 20 per cent in summer and winter season respectively. Overall average cost of labour incurred on cereal production was ₹ 7010.2 per acre i.e. 59.89 Per cent and ₹ 5820 per acre i.e. 49.04% of total cost of cultivation of cereals in summer and winter seasons respectively. Pant and Srivastava (2014) reported similar share of labour cost i.e. 55.30 % to total cost while calculating economics of millets in Uttarakhand state. Other studies (Sureshkumar *et al.*; 2014, Verma *et al.*; 2016) revealed that this labour cost share varied region wise. In Madhya Pradesh share of labour cost in wheat production accounted for about 26 per cent of total cost, while in Gujarat it was 27.70 per cent. Reasons of the more labour cost share in hills may be, less or almost nil

mechanization of agricultural operations in hilly areas, which makes crop cultivation labour intensive and thus results in more labour cost share.

Seeds and manure constituted the major components of material cost in the study area. Material cost accounted for 23.02 per cent in the cost of cereal cultivation with its absolute value of ₹ 2694.20 per acre in summer and 34 per cent with its absolute value of ₹ 4045.80 per acre in winter season.

The per acre rental value of land was ₹ 2000. Large proportion of fixed cost was on account of rental value of owned land constituting 17.08 per cent and 16.85 per cent of total cost of cereal cultivation in summer and winter seasons correspondingly.

Overall magnitude of cost of cereal cultivation was ₹ 11704.40 per acre in summer season and ₹ 11865.80 per acre in winter season.

Table 3 also gives details about gross returns and net returns for all groups of crops. Total returns were estimated by multiplying quantities produced of particular crop and prevailing market prices. It is observed from the table that productivity of cereals was higher in winters i.e. 1169.80 kg per acre, the corresponding figures for summer season were 920.20 kg. Average total returns from cereal production obtained were ₹ 20124.77 per acre in summers and ₹ 23103.55 per acre in winter season. Finally the net returns were obtained to determine the actual earning of sample households from crop production. The average net returns from the production of cereals amounted to ₹ 8420.37 per acre in summer season and ₹ 11237.75 per acre in winter season.

### CONCLUSION

The study was confined to major cereal crops grown in Uttarakhand hills. Despite 100 per cent participation of households in agriculture, earning wise it formed main occupation only for 15.50 per cent of the households while for 84.50 per cent households it was observed as subsidiary occupation. It is important to notice that livestock rearing was only the subsidiary occupation for almost all households. The selected crops that were taken together accounted for around 70% of the gross cropped area. The study is based on the information available by both primary and secondary sources and has made use of the farm level cross-sectional data collected from 200 sample farmers of different hill altitudes. Wheat emerged as the main food grain crop in the study area with its percentage share of 26.98% in the gross cropped area, while paddy (24.21%) was the second major crop in the study area. The cost of cultivation of cereals summer season (₹ 11704/acre) was slightly less than that of cereals in winter season (₹ 11866/acre). Per acre net return from cereals was found to be higher for winter season (₹ 11237.7/acre) when compared to wheat summer season (₹ 8420.37/acre).

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