

# Cost of Cultivation and Farm Income of the Tribal Households: An Analysis of Hill and Plain Regions of Rajasthan (India)

## Abstract

Land is the most important livelihood asset owned and agriculture is the most popular livelihood activity pursued by the rural tribes of Rajasthan but the sustainability of agriculture, both present as well as future, is a major challenge in these areas. In this paper, attempts have been made to explain the economic viability of agriculture as a livelihood source in the rural tribal areas of Rajasthan. The cropping pattern and the crop combinations have been identified to find the nature of the crops grown and the level of crop diversification in both the regions. The crop wise cost of cultivation has been estimated and for that purpose the various cost concepts have been used. Crop productivity per hectare and the gross value of output have been calculated by taking into account the values of main product and by products. Finally, the gross and net farm income for the households has been calculated to know about the earnings from farm business enterprise. It is a comparative analysis of the tribes living in two different geographical areas of Rajasthan; one is hilly and forested where the proportion of the tribal population is more than 80 percent and is covered under the Tribal Sub-Plan scheme. On the other hand, another is plain and fertile where the tribes account for only about 25 percent of the total population and it is not covered under the Tribal Sub-Plan scheme. The study is based on primary data. A field survey has been carried out for the detailed household level information. A total of four hundred households; two hundred from each sub-division has been surveyed for the purpose.

**Keywords:** Tribes, Agriculture, Cropping Pattern, Cost of Cultivation, Farm Income.

## Introduction

Land is the most important livelihood asset owned and agriculture is the most popular livelihood activity pursued by the rural tribes of Rajasthan. About two third households of the hill region and more than 90 percent households of the plain region have their status as self-employed in agriculture. Similarly, about three-fourth of the working individuals of the hill region and more than 90 percent working people of the plain region have reported cultivation as their main economic activity which means that agriculture is the most important life supporting economic activity of the people of both the regions. But the sustainability of agriculture, both present as well as future, is a major challenge in these areas.

It is a comparative study of the tribes living in two different geographical areas of Rajasthan; Ghatol (Banswara) and Lalsot (Dausa) sub-divisions. Ghatol sub-division represents the hill terrain where the proportion of the tribal population is more than 80 percent and is covered under the Tribal Sub-Plan scheme. On the other hand, Lalsot sub-division is plain area with fertile soil. In this region, the tribes account for only about 25 percent of the total population and it is not covered under the Tribal Sub-Plan scheme. The study is based on primary data. A field survey has been carried out for the detailed household level information. A total of four hundred households; two hundred from each sub-division has been surveyed for the purpose.

## Review of Literature

The studies on livelihood pattern show that agriculture is the main economic activity of the tribes but the agriculture in the tribal areas suffers



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from various problems: both physical and technological, resulting in low returns from this occupation.

The studies on land ownership pattern show that though the tribes have access to land; the problems are associated with land quality such as terrain, soil cover and fragmentation of holdings. "The scheduled tribes on an average actually operate holdings bigger than the general category. The all-India average of the ratio (General/ST) of average land holding size is around 0.8 for the time periods, 1981 & 1991 under consideration". (Chadha G.K. et al, 2004)

Jodha, N S (2009) considers the mountainous and hilly terrain as the main limiting factor of agriculture in the tribal areas. "The mountain conditions tend to limit the capacity of the agricultural system to absorb inputs, scope for resource use intensification and up-gradation through infrastructure development, production opportunities and gains associated with the scale of production system, exposure to and replicability of development strategies from plains, generation of surplus and its exchange at favourable terms of trade."

The cropping pattern of tribes lacks in diversification, particularly, towards the high value crops. The study on the district level cropping pattern by Shrivastava, (2000) shows that in the tribal areas of Rajasthan the dominant crops are coarse cereals. In the hilly district of southern Rajasthan maize is the most dominant crop. Even in the fertile plain area of eastern Rajasthan, Bajra is the most important crop.

Thorat, S K (2008), in his book "Rainfed Agriculture: Search for Sustainable Livelihood", the issues of technological stagnation in the dry region have been studied in relation to the irrigated region with the specific purpose of bringing out the differences between the two regions. The new technology has benefited only the wet and irrigated region and the population living there and the rest of the areas and crops grown there have remained neglected. The author suggests that besides a technological breakthrough for the dry land agriculture the development of non-farm activities and strengthening of rural infrastructure are also required.

Sah D C (2009), in his book, 'Tribals and Modern Agriculture' deals with the level of access and adoption of modern agriculture by the tribal farmers of south-western Madhya Pradesh. The level of fertilizer use has been taken as an indicator to measure the access to modern agriculture. Understanding fertilizer use, the author concludes that the farm conditions rather than the farmer's conditions constraints technology transfer in difficult areas like the remote tribal areas.

The computation of cost of cultivation and farm income is very important to find the economic viability of agriculture but there are various conceptual issues involved in as what constitute the cost of cultivation.

Cost structure, as reflected by the share of various inputs in the total cost of cultivation, is determined by the levels of technology and use of modern inputs. "Traditional agriculture was being

carried out by conventional practices and use of traditional inputs like human labour, bullock labour, manure, home grown seeds and marginal use of irrigation. Modern agriculture is more dependent on machine labour, improved seed, chemical fertilizer and large scale use of controlled/ pumped water for irrigation. While, variations in the use of these inputs in different states/ areas show the differences in adoption of technology, changes in the share of various inputs in the total cost of cultivation over the years reflect the extent of technology diffusion" (Sen A, 2005).

The costs of cultivation are usually divided into two components: operational/ variable cost and fixed cost. "In the reporting format of the comprehensive scheme, operational/ variable costs are defined to include all costs other than rent, interest and depreciation on fixed capital and land revenues and taxes. The former depends on the level of current input use and on their prices, while the fixed costs evolve on the basis of past and present investment patterns and on land productivity" (Sen A, 2005).

The Commission for Agriculture Costs and Prices (CACP) has devised various cost concepts for calculating the cost of cultivation for different policy objectives. "Although Cost C<sub>2</sub> is the cost concept discussed most often and used by the Commission for Agriculture Cost and Prices, this is less relevant than paid out cost (Cost A<sub>2</sub>) for judging actual development". Further, "the conceptual considerations and issues of comparability which favours the use of Cost A<sub>2</sub> as the relevant cost concept for judging farm incomes may tend to exaggerate profitability". (Sen A, 2005).

"An increase in paid out cost of cultivation of crops has often raised doubts about the level of profitability of crops over the years. An examination of output-paid out cost ratio of different crops at weighted average level during 1981-86 and 1995-2000 shows, however, that during the overall period under review the margin of profitability in cultivation per hectare has improved in case of paddy, wheat, bajra, tur, groundnut, cotton and sugarcane. Though some of the pulses and oilseed crops have shown a marginal decline in output-cost ratio during this period, their ratio was already relatively high". (Sen A, 2005).

"However, the output-cost ratio only indicates the margin of profit and not the level of profit per hectare. Even with lower margin of profit (low output-cost ratio) per hectare returns may be much higher if productivity is higher". (Sen A, 2005).

"The share of family labour in total cost has increased over the time in most cases, causing the ratio of gross value of output (GVO) to Cost A<sub>2</sub>+FL to fall in several cases whereas the ratio of GVO to Cost A<sub>2</sub> has increased. This however, does not reflect any increase in the use of family labour which has in fact declined in terms of man hours per hectare in most cases, and in large parts a consequence of the change in method of imputation after 1991". (Sen A, 2005).

As agriculture is the main source of livelihood of the tribes, its development is very crucial

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for overall development of the tribes. The problems of agricultural development in tribal areas are not isolated but they are inter-linked. To tackle these problems an integrated approach is needed.

### Objective of the Study

The main objective of the study is to explain the present sustainability and the economic viability of agriculture as a livelihood source in the rural tribal areas of Rajasthan.

The cropping pattern and the crop combinations have been identified to find the nature of the crops grown and the level of crop diversification in both the regions.

The crop wise cost of cultivation has been estimated and for that purpose the various cost concepts have been used. While calculating the cost of cultivation both paid out cost and imputed value of the owned assets have been included.

Crop productivity per hectare and the gross value of output has been calculated by taking into account the values of main product and by products.

Finally, the gross and net farm income for the households has been calculated to know about the earnings from farm business enterprise.

### Cropping Pattern

The cropping pattern details of both the regions have been provided in table 1.

**Table 1: Cropping Pattern (2011-12)**

Hill Region		Plain Region	
Crop	Percentage GCA	Crop	Percentage GCA
Maize	51.6	Mustard	26.3
Wheat	31.1	Wheat	18.8
Gram	9.0	Millet	17.2
Rice	3.5	Sesame	11.4
Soyabean	2.2	Ground Nut	9.6
Others	1.7	Guar	7.9
Urad/Mong	0.8	Others	6.5
Sesame	0.1	Gram	2.2
All Crops	100.0	All Crops	100.0

**Source:** Field Survey (Dec.2011 & April 2012)

### Hill Region

Maize is the most dominant crop in the hill region as it accounts for 51.6 percent of the gross cropped area. It is mainly a kharif crop but also grown in rabi season as an irrigated crop. Wheat is the second rank crop and it occupies 31.1 percent of the total cropped area. Thus, these two cereal crops account for more than 80 percent of the cultivable land. Gram is the third rank crop and covers 9.0 percent of the gross cropped area. Rice, locally known as Sal, is also grown in the low lying areas where the canal water is available. Soyabean, urad/moong, Sesame etc. are the other crops but none of them occupies a significant proportion of the gross cropped area. Thus, cereals, both coarse and fine grained, dominate the cropping pattern of the hill region.

### Plain Region

Unlike the hill region, no single crop dominates the cropping pattern in the plain region. Mustard, a high value cash crop, is the first ranking crop of the region which is grown only on 26.3 percent of the gross cropped area. Wheat, a fine cereal, is second ranking crop and occupies 18.8 percent of the gross cropped area. The water requirement of wheat is more and thus it is grown in areas where water availability is not a limiting factor. Millet, a coarse cereal and fodder crop, is grown on 17.2 percent of the gross cropped area. Sesame and ground nut, other high value cash crops, occupies 11.4 percent and 10.0 percent of the gross cropped area respectively. Thus, the cropping pattern of the plain region is highly diversified and the diversification is mostly towards the high value cash crops.

A comparison of the cropping pattern of the two regions shows that there is a dominance of two crops in the hill region but the cropping pattern of

plain region is comparatively diversified. Secondly, in the hill region the dominant crops are cereals grown mostly for domestic use but in the plain region most of the crops are cash crops grown mainly for the market.

### Crop Combinations

The crop combination of a particular region shows the level of crop diversification by showing if that particular region is a mono-crop region, two-crop region, three-crop region or a diversified crop region. For the identification of the crop combinations J. C. Weaver's Least Square Method has been used. The method is based on statistical approach and provides a better objective grouping of crops in a region.

**Table 2: Crop Combinations (2011-12)**

Region	No. of Crops	Crops
Hill Region	2	Maize, Wheat
Plain Region	6	Mustard, Wheat, Millet, Sesame, Ground Nut, Guar

**Source:** Field Survey (Dec. 2011 & April 2012).

As per the Weaver's method, the hill region is a two crop region (maize and wheat) whereas the plain region is a six crop region (mustard, wheat, Millet, Sesame, ground nut and guar). Thus, there is a dominance of only two crops and that of the cereal crops in the hill region. It suggests the subsistence type of agriculture prevailing in the hill region. On the other hand, the plain region is a six-crop region and most of them are the high value commercial crops which suggest that most of the crops are grown for the market.

### Cost of Cultivation

In this section, attempts have been made to explain the cost of cultivation and cost structure for different crops. The methodology adopted for

calculating the cost of cultivation is that followed by the Comprehensive Scheme for Studying Cost of Cultivation/ Production of Principal Crops in India adopted in 1970-71 and reviewed twice in 1980 and 1991. The cost structure

of individual crops has been explained by showing the share of major cost items; seeds, fertilizer, irrigation, human labour, bullock labour and farm machinery in total cost of cultivation.

**Table 3: Hill Region: Cost of Cultivation (2011-12)**

Crop/ Cost	Seeds	Fertilisers	Irrigation	Human Labour	Bullock Labour	Farm Machine	Paid Out Cost A <sub>2</sub>	Cost A <sub>2</sub> +FL	Total Cost C <sub>2</sub>
Maize	339 (2.2)	1411 (9.0)	31 (0.2)	4124 (26.4)	5153 (33.0)	246 (1.6)	8608 (55.1)	12627 (80.8)	15619
Rice	1077 (5.5)	1490 (7.6)	156 (0.8)	5551 (28.2)	5874 (29.9)	964 (4.9)	10515 (53.4)	15549 (79.0)	19673
Soyabean	1768 (10.4)	500 (2.9)	24 (0.1)	3899 (22.9)	2059 (12.1)	1776 (10.4)	7775 (45.7)	10655 (62.6)	17021
Urad/Mg	1684 (9.6)	182 (1.0)	0 (0.0)	5493 (31.2)	6047 (34.4)	0 (0.0)	8219 (46.7)	13713 (78.0)	17586
Sesame	307 (2.3)	0 (0.0)	0 (0.0)	3520 (26.3)	5367 (40.1)	0 (0.0)	5680 (42.4)	9200 (68.7)	13400
Other	1148 (5.9)	326 (1.7)	6 (0.0)	4440 (22.9)	8184 (42.2)	0 (0.0)	10320 (53.2)	14760 (76.2)	19380
Wheat	1982 (6.1)	2555 (7.9)	2740 (8.5)	5923 (18.4)	8491 (26.3)	1836 (5.7)	18156 (56.3)	23797 (73.8)	32263
Gram	3010 (13.8)	789 (3.6)	533 (2.4)	2846 (13.0)	7168 (32.8)	729 (3.3)	12524 (57.3)	15342 (70.2)	21841

Source: Field Survey (Dec.2011 & April 2012).

Note: Figures in brackets show percentage of total cost

#### Hill Region

The details of the cost of cultivation and cost structure of the crops of the hill region have been provided in table 3.

The analysis of the cost of cultivation and its structure in the hill region brings out that the total cost of cultivation (Cost C<sub>2</sub>) is more for rabi crops and it is maximum for wheat. This is because more number of ploughing and sowing operations are required for these crops and at the same time most of them are irrigated crops requiring more expenditure on this head. The share of the paid out cost (Cost A<sub>2</sub>) in total cost varies between 50 and 60 percent for majority of the crops with the exception of the minor crops like soyabean and Sesame. If the cost of the family labour is also included in the paid out cost (Cost A<sub>2</sub>+FL) then it makes up more than three-fourth of the total cost for crops like maize, rice urad/moong and rice.

The cost structure shows that bullock labour is the single most important cost item accounting for about 30-40 percent of the total cost for majority of the crops. Most of

the households own a pair of bullock and the small size of the holdings means less than optimum use of the pair of bullocks resulting in very high per unit cost of bullock labour. Human labour is another important cost head accounting for about one-fourth of the total cost of cultivation. But the share of this cost item is less for rabi crops like wheat and gram. With the exception of soyabean (a minor crop), the share of farm machinery in total cost is either nil or very low. The share of irrigation in total cost is 8.5 percent for wheat (maximum for any crop), which is grown as an irrigated crop, followed by gram (2.4 percent) but in rest of the crops its share is either nil or less than one percent. Fertilizers are responsible for about 7-9 percent of the total cost of the cereal crops like rice wheat and maize but in rest of the crops the share of fertilizers in total cost is insignificant. Thus, the cost structure of the crops of the hill region, in which the majority of the cost pertains to bullock labour and human labour, reflects the traditional character of the agriculture.

**Table 4: Plain Region: Cost of Cultivation (2011-12)**

Crop/ Cost	Seeds	Fertiliser	Irrigation	Human Lab.	Bullock Lab.	Farm Machine	Paid Out Cost A <sub>2</sub>	Cost A <sub>2</sub> +FL	Total Cost C <sub>2</sub>
Millet	971 (5.5)	967 (5.5)	87 (0.5)	5751 (32.6)	0 (0.0)	3087 (17.5)	6926 (39.2)	12145 (68.8)	17647
Ground Nut	8326 (19.3)	2286 (5.3)	1228 (2.9)	5846 (13.6)	0 (0.0)	2757 (6.4)	17501 (40.6)	22327 (51.8)	43079
Guar	4474 (12.7)	235 (0.7)	0 (0.0)	4308 (12.2)	0 (0.0)	2998 (8.5)	8328 (23.6)	12308 (34.9)	35306
Sesame	252 (2.4)	159 (1.5)	0 (0.0)	2697 (25.9)	0 (0.0)	1763 (16.9)	2972 (28.5)	5142 (49.3)	10427
Other	671 (2.0)	1296 (3.8)	11489 (33.8)	8638 (25.4)	0 (0.0)	4531 (13.3)	18908 (55.6)	27011 (79.4)	34007
Wheat	3015 (6.5)	4199 (9.0)	7273 (15.6)	9504 (20.4)	0 (0.0)	5965 (12.8)	22172 (47.5)	30514 (65.4)	46661
Mustard	434 (1.2)	2571 (7.1)	3082 (8.5)	5632 (15.6)	0 (0.0)	5125 (14.2)	12582 (34.8)	17105 (47.3)	36176
Gram	3343 (11.5)	870 (3.0)	1217 (4.2)	2638 (9.1)	0 (0.0)	3950 (13.6)	9907 (34.1)	12220 (42.0)	29066

Source: Field Survey (Dec.2011 & April 2012).

Note: Figures in brackets show percentage of total cost

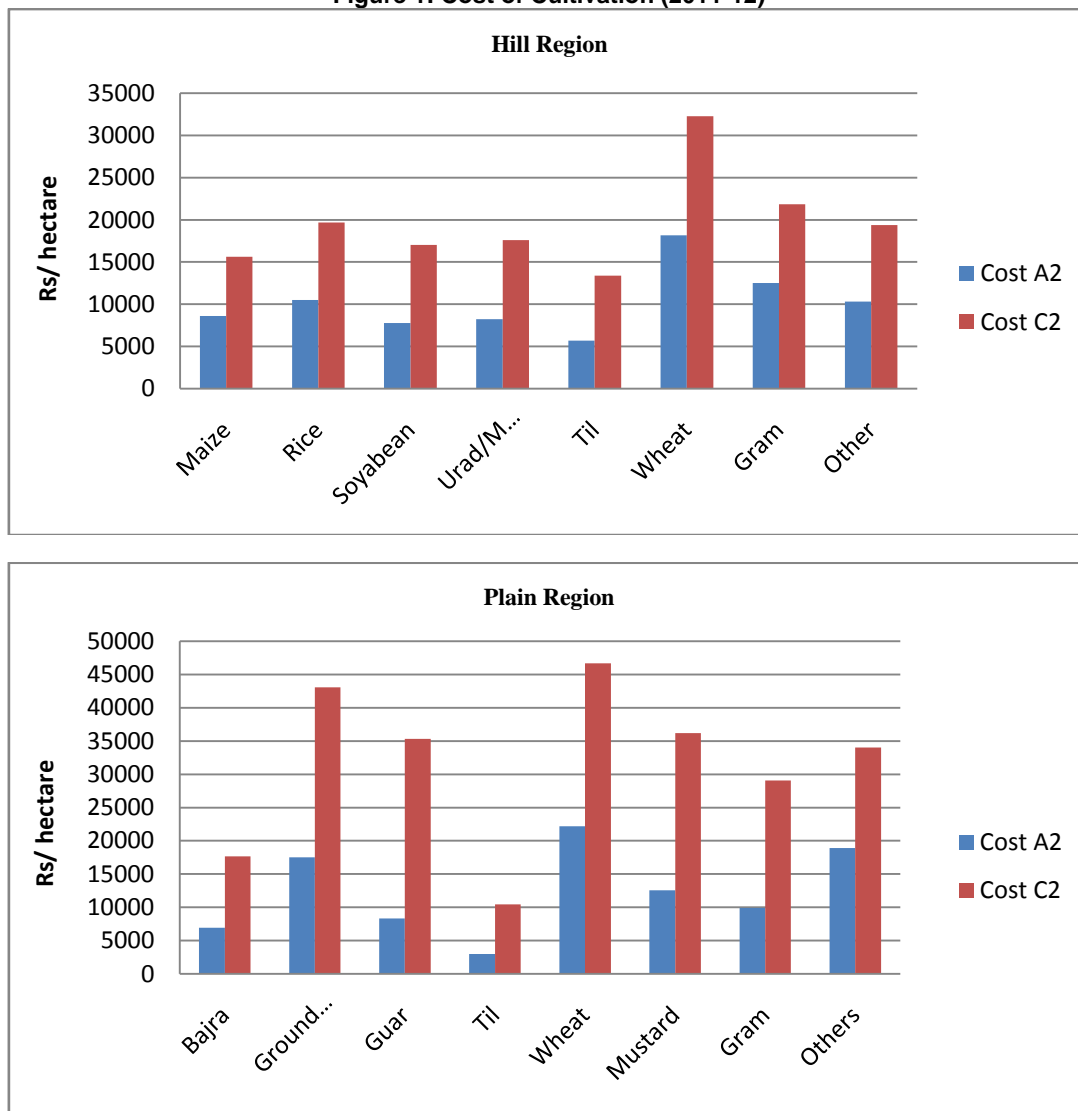
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### Plain Region

Table 6.7 provides the crop wise cost of cultivation details of the plain region. The crop wise analysis of the cost of cultivation in the plain region shows that the total cost of cultivation is maximum for wheat followed by ground nut. On the other hand, the cost of cultivation is very low for kharif crops like Sesame and Millet. The share of paid out cost (Cost A<sub>2</sub>) in total cost is more in the input intensive crops like others and wheat. Human labour is the most important cost item in the plain region however; its share in the total cost varies from 9.1 percent for gram to 32.6 percent for Millet. The use of bullock labour has been replaced by the farm machinery. The share of farm machinery in the total cost varies between 12

to 18 percent for most of the crops. Seeds form a significant proportion of the total cost for crops like ground nut (19.5 percent), guar (12.7 percent) and gram (11.5 percent). But, the share of seeds in total cost is as low as 1.2 percent for mustard and 2.0 percent for other crops. Fertilizers account for less than 10 percent of the total cost of cultivation for all the crops. Its share is maximum (9.0 percent) for wheat and minimum (0.7 percent) for guar crop. The share of irrigation in total cost is insignificant for all the kharif crops except ground nut. On the other hand, irrigation is a significant cost item for all the rabi crops as the proportion of this item in total cost is as high as 33.8 percent for other crops and 15.6 percent for wheat crop.

Figure 1: Cost of Cultivation (2011-12)



Source: Field Survey (Dec.2011 & April 2012).

### Crop Output and Receipts

The crop production and productivity per hectare is the outcome of the physical and cultural factors. The terrain, soil condition and water availability provides the physical basis of crop output. The cultural factors like the quantity and quality of use of

physical inputs (seed, chemical and bio-fertilizers, pesticides/ insecticides, irrigation etc), level of mechanisation and diffusion of modern elements of agriculture also determine the crop productivity.

**Hill Region**

The agriculture in the hill areas suffers from various problems on both physical and socio-cultural fronts. Geographically, these are the negative areas characterised by undulating terrain, small size of holdings with poor soil cover. The agriculture in the tribal areas is characterised by the dominance of

traditional low value crops, low level of input use, traditional methods of cultivation and limited farm mechanisation. All these factors result in low level of crop production and productivity per hectare. Table 5 provides the crop wise output/ receipt details of the hill region.

**Table 5: Hill Region: Crop Output & Receipts (2011-12)**

Crop	Quantity (Kg/hect.)	Value of Output (Rs/ hectare)		
		Main Product	By-Product	Total
Maize	725	7485	1147	8632
Rice	924	10256	1528	11785
Soyabean	865	17306	882	18188
Urad/Moong	316	9733	1333	11067
Sesame	200	12000	0	12000
Others	735	11925	1275	13200
Wheat	1695	21703	2486	24190
Gram	536	17303	1266	18569

**Source:** Field Survey (Dec.2011 & April 2012).

The analysis of the table shows that wheat is the most important crop of the region in terms of both physical productivity and value of the product per hectare. Though gram is not an important crop in terms of physical productivity but it is very important in terms of the value of the product. The physical productivity of rice is quite high for rice but in value terms this is not important as the rice grown in this region is of poor quality. The gross value of output per hectare is lowest for maize, the crop which dominates the cropping pattern of the region.

**Plain Region**

The physical conditions, such as the plain surface, fertile alluvial soil and availability of underground water, are more favourable for agriculture in the plain region. The large size of holdings, more input use and greater degree of mechanisation result in a relatively better crop production and productivity per hectare. Table 6 provides the crop wise productivity and receipt details of the plain region.

**Table 6: Plain Region: Crop Output & Receipts (2011-12)**

Crop	Quantity (Kg/hect.)	Value of Output (Rs/hectare)		
		Main Product	By-Product	Total
Millet	1294	13206	2513	15719
Ground Nut	1363	56494	2797	59291
Guar	948	65491	219	65711
Sesame	329	15090	11	15101
Others	533	19774	215	19989
Wheat	3178	41766	4371	46137
Mustard	1593	52349	2140	54489
Gram	1281	46600	1533	48133

**Source:** Field Survey (Dec.2011 & April 2012).

The crop wise analysis of crop productivity/ receipts shows that most of the crops of the plain region are high value crops. Though the physical productivity is very high for wheat but in terms of the value of output, it ranks fifth among all the crops of the region. On the other hand, guar has a physical productivity of only 948 kg/ hectare (third lowest among all the crops) but in value terms the productivity is highest in the region. The crop productivity in value terms is also high for crops like mustard, ground nut and gram.

**Net Farm Income**

The gross farm income depends on the physical productivity of the crop and the prevailing prices in the market at the time of the sale of the product. However, the net farm income or the margin of profit of the farming enterprise also depends on the cost of cultivation and the cost concept utilized for calculating net farm income. For the purpose of calculating net farm income, three alternative cost concepts; Cost A<sub>2</sub>, Cost A<sub>2</sub>+FL and Cost C<sub>2</sub> have

been utilized. Cost A<sub>2</sub> takes into account all the paid out costs and thus more relevant concept for calculating farm business income. The Cost A<sub>2</sub>+FL is the cost concept which includes the paid out cost as well as the imputed value of family labour. Thus, it is more relevant for calculating family labour income. Cost C<sub>2</sub> is a comprehensive cost concept which takes into account total economic cost; variable as well as fixed costs. This is the cost concept discussed most often and used by the Commission for Agriculture Costs and Prices (CACP). Further, the gross value of output to cost ratio has been calculated for all the three cost concepts in order to explain the margin of profit for a particular crop.

**Hill Region**

Table 7 provides the crop wise details of net farm income (Rs/hectare) and gross value of output to cost ratio over the three alternative cost concepts.

**Net of Cost A<sub>2</sub>**

The farm income net of cost A<sub>2</sub> represents the farm business income. The income net of Cost A<sub>2</sub>

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is positive for all the crops. The crop wise analysis shows that the net income is maximum for soyabean (Rs 10413 per hectare) followed by the income of Sesame (Rs 6320 per hectare). However these two crops occupy very small proportion of the gross

cropped area of the hill region. The net income is over Rs 6000 for rabi crops like wheat and gram. On the other hand, the net farm income of maize which occupies more than 50 percent of the gross cropped area is only Rs 24 per hectare.

**Table 7: Hill Region: Net Farm Income & GVO/ Cost Ratio (2011-12)**

Crops	Net Income (Rs/hectare)			Gross Value of Output /Cost		
	Cost A <sub>2</sub>	Cost A <sub>2</sub> +FL	Cost C <sub>2</sub>	Cost A <sub>2</sub>	Cost A <sub>2</sub> +FL	Cost C <sub>2</sub>
Maize	24	-3995	-6987	1.00	0.68	0.55
Rice	1270	-3764	-7888	1.12	0.76	0.60
Soyabean	10413	7533	1167	2.34	1.71	1.07
Urad/Moong	2848	-2646	-6519	1.35	0.81	0.63
Sesame	6320	2800	-1400	2.11	1.30	0.90
Others	2880	-1560	-6180	1.28	0.89	0.68
Wheat	6034	393	-8073	1.33	1.02	0.75
Gram	6045	3227	-3272	1.48	1.21	0.85

Source: Field Survey (Dec.2011 & April 2012).

**Net of Cost A<sub>2</sub>+FL**

The farm income net of cost A<sub>2</sub>+FL includes all the paid costs as well as the imputed value of the family labour. The net income derived on the basis of cost A<sub>2</sub>+FL is negative for most of the kharif crops except soyabean and Sesame for which it is Rs 7533 and Rs 2800 respectively. On the other hand the net income is positive for the rabi crops like wheat (Rs 393/ hectare) and gram (Rs 3227/ per hectare). The extent of losses incurred per hectare is as high as Rs 3995 for maize and Rs 3764 for rice crops.

**Net of Cost C<sub>2</sub>**

Cost C<sub>2</sub> is a comprehensive cost concept which includes all the economic cost both operational

as well as fixed. Besides the Cost A<sub>2</sub>+FL, it includes the rental value of the owned land. The net income (Cost C<sub>2</sub>) is negative for all the crops except soyabean for which it is Rs 1167 per hectare of the cultivated area. On the basis of this concept, the extent of loss incurred per hectare is highest for wheat (Rs 8073) followed by that of the rice crop (Rs 7888). The losses are relatively low for gram and minimum for Sesame crop (Rs 1400).

**Plain Region**

The crop wise details of net farm income (Rs per hectare) and gross value of output/ cost ratio over the alternative costs have been provided in table 8.

**Table 8: Plain Region: Net Farm Income & GVO/ Cost Ratio (2011-12)**

Crops	Net Income (Rs/hectare)			Gross Value of Output /Cost		
	Cost A <sub>2</sub>	Cost A <sub>2</sub> +FL	Cost C <sub>2</sub>	Cost A <sub>2</sub>	Cost A <sub>2</sub> +FL	Cost C <sub>2</sub>
Millet	8794	3574	-1928	2.27	1.29	0.89
Ground Nut	41790	36964	16212	3.39	2.66	1.38
Guar	57382	53403	30404	7.89	5.34	1.86
Sesame	12129	9959	4674	5.08	2.94	1.45
Others	1081	-7022	-14018	1.06	0.74	0.59
Wheat	23965	15623	-525	2.08	1.51	0.99
Mustard	41907	37384	18313	4.33	3.19	1.51
Gram	38226	35914	19067	4.86	3.94	1.66

Source: Field Survey (Dec.2011 & April 2012).

**Net of Cost A<sub>2</sub>**

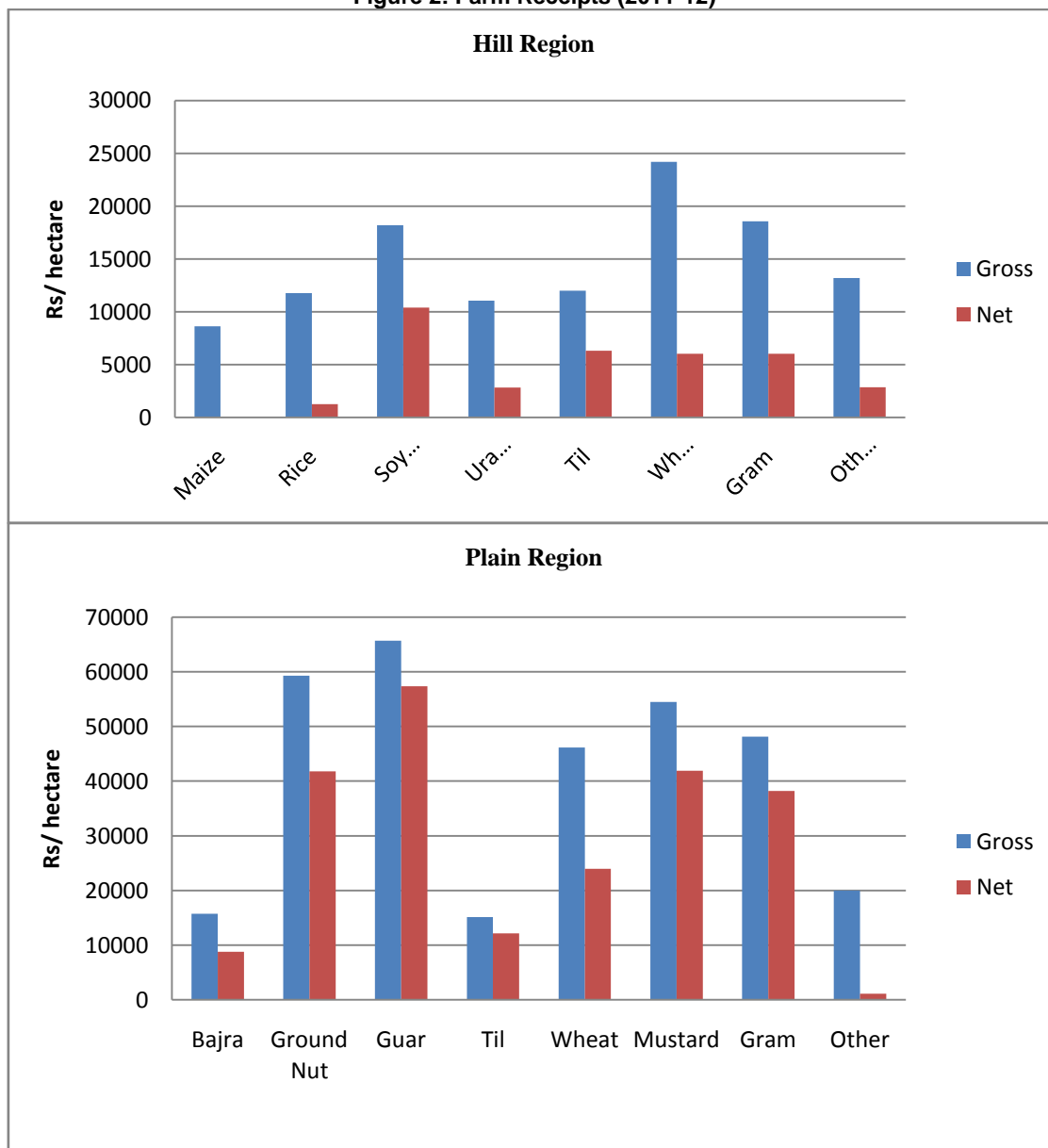
The farm business income or the income net of Cost A<sub>2</sub> is positive for all the crops in the region. The net income is exceptionally high for guar crop (Rs 57382) mainly because of very high price of guar in that particular year. Mustard and ground nut are the other crops having substantially high net farm income as the net income of these two crops are Rs 41790 for and Rs 41907 for ground nut and mustard respectively. On the other hand, the net farm incomes are only Rs 8794 for Millet and Rs 1081 for 'other' crop. The very low margin of profit of other crop is

mainly because of the failure of soamp crop in that particular year.

**Net of Cost A<sub>2</sub>+FL**

In the plain region, the net farm income, derived after making provisions for Cost A<sub>2</sub>+FL, is positive for all the crops but the 'other' crop. Again, the net income is highest for guar crop (Rs 53403/ hectare) and it varies between Rs 35914 and Rs 37384 for gram, ground nut and mustard crops. The net income for the cereal crops like wheat and Millet are relatively low.

Figure 2: Farm Receipts (2011-12)



Source: Field Survey (Dec.2011 & April 2012).

**Net of Cost C<sub>2</sub>**

Even if we take into account all the economic cost of production, the net farm income is positive for most of the crops but millet, wheat and others are the crops with negative net income. The net farm income is as high as Rs 30404/ hectare for guar crop followed by the net income of gram (Rs 19067). Similarly, mustard and ground nut are the crops having net farm incomes of Rs 18313 and Rs 16212 respectively.

The analysis shows that the farm business income is positive for all crops and the family business is income is positive for all but others crop. The margin of profit is exceptionally high for guar crop mainly because of the excessive price in that particular year. For other crops, the margin of profit is higher for oilseed crops like mustard and ground nut and it is relatively low for cereal crops like wheat and Millet.

**Conclusion**

The whole analysis of agriculture in the tribal areas makes out the following points:

The cropping pattern of the hill region is dominated by the traditional low value cereal crops (two crop region) whereas the cropping pattern of the plain region is diversified (six crop region). Further, the majority of the output in the hill region is consumed domestically but in the plain region, most of the crops grown are for commercial purpose.

The agriculture in the hill region is characterized by the use of traditional inputs like home grown seeds, manure, bullock and family labour. The use of modern inputs like the HYV seeds and chemical fertilizers are very limited. The HYV seeds are being used to the extent that they are being provided free of cost. In the plain region also, most of the seeds used belong to the local variety but the



level of use of fertilizers and irrigation are relatively more. Further there is a complete mechanization of the ploughing and sowing farming operations. It is because of the availability of these facilities (mainly irrigation) that the rabi crops dominate the cropping pattern in the plain region.

The structure of the cost of cultivation shows that bullock labour (30-40 percent) and human labour (20-25 percent) are the two important cost items in the hill region which reflects the traditional character of the agriculture. On the other hand, human labour is the most important cost item in the plain region followed by the cost of tractor and farm machinery. Irrigation and chemical fertilizers are the other important cost items mainly for the rabi crops of the region. The relatively greater share of the modern inputs in the total cost of cultivation reflects the elements of modern agriculture in the plain region.

In the hill region, the share of the paid out cost (Cost  $A_2$ ) varies between 40-60 percent of the total cost (Cost  $C_2$ ) and if the cost of the family labour is also added the proportion of Cost  $A_2+FL$  reaches to 70-80 percent. On the other hand, the share of Cost  $A_2$  in total cost varies between 20-40 percent in the plain region.

Both the physical productivity and the gross value of output (GVO) for most of the crops are very low in the hill region. The GVO of maize, which occupies greater than 50 percent of the gross cropped area, is only Rs 8632 per hectare. The crop having the maximum gross value of output in the region is wheat with a GVO of Rs 24190 per hectare. On the other hand, most of the crops grown in the plain region are high value crops and the GVO varies from Rs 15,101 for Sesame to Rs 65711 for guar. The gross value of output for mustard (ranks first in the cropping pattern) is as high as Rs 54,489 per hectare.

In the hill region, the net farm income (net of Cost  $A_2$ ) is positive for all crops but the net farm income (net of Cost  $C_2$ ) is negative for all crops except soyabean. On the other hand, in the plain region, the net farm income is not only positive net of Cost  $A_2$  but it is positive net of Cost  $C_2$  for majority of the crops. Further, the margin of profit is also high for the crops of the plain region.

Finally, the proportion of the tribal households having access to or awareness of the elements of modern agriculture is also very low in both the regions.

#### **Scope of the Study**

The paper is a part of my Ph.D. thesis. The study was initiated in year 2011 and it was submitted in 2014 and subsequently awarded in 2015. The current paper was presented in the 33<sup>rd</sup> International Geography Congress (IGU) Conference at Beijing in 2016. The paper will be useful for those who are

working on the conditions and returns from agriculture particularly in the tribal areas.

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