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Estimation of resource use efficiency of inputs on tribal and Non-tribal farm of Mirzapur district of U.P.

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Abstract

On the basis of percent of tribal population living in the district Mirzapur of Uttar Pradesh, 128 respondents (64 each from tribal and non-tribal) were selected from the Haliya and Marriyan blocks. Cost of cultivation was calculated to study the resource use efficiency of crops grown in both, kharif and rabi, seasons. Though the positive impact of various variables was observed on yield per hectare of all the crops, grown by tribal and non-tribal farmers but the coefficients of regression, elasticity R^2 of labour use, fertilizer and irrigation were found very low. It indicates that increase of 1 percent in any of these variable is unable to enhance the production or productivity/ha of these crops in these blocks, significantly. Thus need is there to identify the other economic activities for enhancing the income of tribal as well as non-tribal farmers of both the block of Vindhyan zone, Mirzapur.

Key words: tribal and non-tribal, production, income, coefficients

Introduction

Agriculture continues to be the mainstay of Indian economy and substantial part of the Indian population (29 per cent) continues to live below poverty line (Economic Survey, 2005-06). The poorest section belongs to the small- and marginal farmers, landless labor, scheduled castes & scheduled tribes. In India, tribal's are placed in the constitution as alexia group of weaker section, which is extremely poor and is distinct social institutions and culture, for the purpose of special treatment. Therefore, the fate of about 45 million tribal populations, spread over extensive regions of India, has been a matter of concern for the successive government. Poor income and employment, poor technology of diffusion, uneconomic land holdings, lack of necessary infra-structure of development, illiteracy, various forms of exploitation in product and factor markets, high debt burden etc., are said to be the main problems of tribal communities in India (Dhebar Commission, 1961, Govt. of India; Sivaraman Committee, 1981, Govt. of India). However, when compare these problems of tribals with the problems of their counter-parts in non-tribal category brought out by large number of studies on Integrated Rural Development Programme (Dhillon, and Sandhu, 1988), it is noticed that they appear to be, by and large, similar in nature.

Studies conducted in different parts of the country indicate a positive impact of these special development efforts on tribal economy (Kulandaiswamy, *et al.* 1987). Interestingly, contrary to common belief, a recent study conducted by (Debases Negi, 2009) revealed that economic factors are more important than socio-cultural factors for adoption of new technology on tribal farms. During 1999-2000 are fund to have less poverty ratio in some sate at the national level of north east region. Thus, the increased income and employment through creating more infrastructures in agriculture and through creating the opportunities in non form sectored. Reduced the agro-economic disparities between tribal and non tribal due to the developmental efforts undertaken so for might have improved technology adoption. Few studies were conducted mainly in Northeast, Bihar, and M.P., Himachal Pradesh indicate such phenomenon (Thakur, 1992). However, it needs to be empirically confirmed across different geographic regions of the country.

Thus, a fresh look is needed at this juncture to examine the differences between tribal and non-tribal in agro-economically reasons rather than socio-cultural are still existing? Such a study will be helpful in accessing whether development planning for tribals should continue separately or their developmental problems can be dealt with in the mainstream economic planning and programmes.

Few some resent study were found the resource use was not fully utilized in the all category of farmers the highest utilization of resource was recorded for large scale farms, and then followed by medium scale farms and lastly the small scale farms (Mondal and Mishra 2011.; Isa. J. Okpe eat al 2012)

The present study was conducted in undivided Uttar Pradesh, which has more than 50 percent

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population of tribals in some blocks of Mirzapur . About 0.9 per cent tribal population of India lives in Uttar Pradesh, which is 0.3 per cent of its own population (Tribal Census Report, U.P. 1980-81). However, 80 per cent of tribal population is concentrated in hilly area of the state. The state has five scheduled tribes, Ragi and Bhotia (mainly in Pithoragarh district), Buksa, Tharu (mainly in Nainital district) and Jaunsari (mainly in Dehradun district).In eastern part of Uttar Pradesh ,some tribals are also found in Vindhayan region. Nearly 50 per cent of the tribal population is working in rural areas and engaged in different agricultural and allied activities with cultivators comprising 78 per cent of tribal population (Tribal Census report, U.P. 1980-81). Looking the present importance of study in view of above facts as mentioned by different authors, it is important to conduct a separate study to examine the attitude of tribal community with respect to adoption of new agricultural technologyin eastern part of Uttar pradesh. With this backdrop the present study was undertaken with the objective of assessing the resource uses efficiency of principal crops on tribes and non-tribes farms of Mariyan and Haliya block of district Mirzapur of U.P.

Methodology

The district Mirzapur is situated in North-east semi temperate agro-climatic region of Uttar Pradesh. The area of the district falls under Gangetic plain and Vindhyan hill region. The land, in general, is fertile plain and expanded in Ganga region. This region is specific by 68 km East and west length and 32 km North and south west. The district have problem for ground water resource and also has unsecured irrigation facility.

Out of 70 districts, Mirzapur district was selected for the present study, as it has the highest concentration of tribe population in U.P. Mirzapur district has twelve block namely, Cehanvey, Kaon, Majhwa, Pahari, Lalganz, Haliya, Nariyan, Rajgarh, Sikhand, Narayanpur, Samalpur Nagar, and trible population in these blocks vary from 14 to 55 per cent of total population and thus selected for this study (table-1). Out of total 213 and 140 villages in the Haliya and Marriyan blocks, respectively of Mirzapur, a sample of 8 villages (4 village from each block tribe and non-tribes population) was selected purposively for the present study.

A list of all the households along with their land holding of the selected villages was prepared with the help of pradhan. All the households were categorized into two groups i.e. tribes and non tribes. A total sample of 128 household (64 tribes and 64 non tribes) was randomly selected from all selected villages. The study is based mainly on primary data collected from selected respondents. Information on family size, educational level, source, operational area, land tenure system, sources of irrigation and cropping pattern, inventory of farm assets, cost of cultivation of principal crops grown on tribal and non-tribes was collected for the year 2005-06, through personal interview method. Secondary data on agro-economic profile of the district was also obtained from the agricultural Shankhiky Patrika of the district Statistical Office.

Analytical frame work

Computation of resource use efficiency

The resource use efficiency of principal crops was estimated by using production function approach. Regression analysis was done for estimating the input-output relationship (Production function) for the principal crops. The appropriate form of Cobb-Douglus type of production function was used.

$$Y = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4}$$

This can be written in log linear formula,

$$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + \log b_4 X_4$$

where,

Y = yield per hectare (qtls)

X_1 = per hectare human labour (mandays)

X_2 = per hectare land preparation (in Rs.)

X_3 = per hectare irrigation (in Rs.)

X_4 = per hectare fertilizer and manure (in Rs.)

a = constant

b_1, b_2, b_3 and b_4 are the regression coefficient.

Estimation of resource use efficiency

The resource use efficiency of different input used for production of principal crops on tribal and non-tribal groups were examined, using the criteria of comparison of marginal value productivity (MVPs) of different inputs with their acquisition costs based on above production function. A resource of input was considered to be used efficiency whose MVP is sufficient to offset its cost. Equality of marginal value product of a resource of its factor cost is, therefore, the basic condition that must be satisfied to obtain the resource use efficiency of a resource.

Estimation of marginal physical product and marginal value of product

The marginal physical productivity (MPP) of resources was estimated by taking partial derivatives of yield (Y) with respect to the concentrate input at their geometric mean levels. The procedure followed was as under:

$$Y = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} \text{ ----(1) (production function)}$$

Partial derivatives of yield (Y) with respect to X_i is,

$$\frac{\partial Y}{\partial X_1} = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} \ldots.. \quad (2)$$

$$= aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4}$$

$$= b_1 \frac{Y}{X_1}$$

Since $\frac{Y}{X_1}$ is average physical product of X_1 (APP_{X1})

and $\frac{\partial Y}{\partial X_1}$ is marginal physical product of X_1

Since is average physical product of X_1 (APP_{X1}) and is marginal physical product of X_1 (MPP_{X1}). The $MPP_X = b_1 APP_{X1}$ i.e. the MPP_{X1} obtained by multiply its regressions coefficient (b_1) by its APP at geometric mean level of both Y and X_1 and the marginal value product of X_1 (MVP_{X1}) can be obtained by multiplying the marginal physical product of X_1 by the price of output i.e.

$MVP = MPP_{X1}P_Y$

In general for the i^{th} resource

$$APP_{X1} = \frac{Y}{X_1}$$

$MPP = APPx\ b_i$

$Since = b_1 = MPP/APP$

$MVP_i = APPx\ b_i \times Py$ or $MPP_x\ P_y$

where,

Y = geometric mean level of output

X_1 = geometric mean level of i^{th} input

b_1 = elasticity coefficient of i^{th} resources (CP)

P_y = price of output.

To test the significance of difference of marginal value product with its acquisition cost 't' test was applied in the following manner:

$t= MVP_{xi} - P_{xi} / SE(MVP_{xi})$

where,

$SE(MVP_i) = APP_{xi} . SE(b_i)$

AVP_{xi} = Average value product of I^{th} input

$SE(b_i)$ =Stander error of regression coefficient of I^{th} input

Results and discussion:

The separate production function as hypothesized in the methodology chapter was separate cropping system for two farm groups' e.i. tribe and non-tribe. A separate production function were also estimated under principal crops viz. wheat, paddy, potato pea, gram mustard, sugarcane, ratoon, til, and arhar to examine the resource use efficiency of various input. The result of production function (Cobb-Dauglas type) in which yield/ha was taken as a dependent variable and human labour/ha (in man days), land preparation, irrigation, and fertilizer in rupees/ha for principle crops (Table 5).

Wheat

Regression coefficients (production elasticity) of human labour were found negative for both tribal and non-tribal farms. It means that the human labour was not critically influencing the production of wheat in tribal as well as non-tribal farms. The non-significant nature of human labour was due to high availability of family labour and machine use. In case of land preparation coefficient was found negative and non-significant in both the tribal and non-tribal farms.

The positive and significant coefficient for irrigation was observed for both the groups. The production elasticity of irrigation shows that 1 per cent increase in use of irrigation charges may increase the productivity of wheat by 0.034 % and 0.05%, respectively of tribal and non-tribal farms. On the other hand the production elasticity of fertilizer was found significant for both the groups indicating positive impact on output per hectare. It means that 1% increase in fertilizer application will result in an increase in output per hectare by 0.084 and 0.192 % respectively on tribal and non-tribal farms. It may be inferred, based on the coefficient of multiple determination (R^2) that the explanatory variable (labour, land preparation, irrigation and fertilizer included in the regression model for wheat were responsible for 68 and 92 percent of variation on non-tribal and tribal areas, respectively.

Potato

The next principal crop for rabi season was potato and regression coefficient of labour were estimated as positive and significant for both the tribal and non-tribal farms. The production elasticity of labour indicates that one per cent increase in the labour will lead to increase potato yield by 0.204 and 0.332 per

Table 1: Occupation-wise population distribution on sample farms

Occupations of Household	Non-Tribal			Tribal		
	No	Population	%age	No.	Population	%age
Total No. HH	64	153	100	64	225	100
Wage laborers	32	136	88	59	219	97
Household owned tractors	4	4	3	1	1	1
Business	10	11	7	0	0	0
Government. Services	1	1	1	0	0	0
Private Services	1	1	1	4	5	2

Table 2: Per farm inventory on sample farm

Particular	Non-Tribe (No.)	Tribe (No.)
Tractor, cultivators	0.08	0.02
Thrasher	0.34	0.16
Pumping/Engine	0.25	0.22
Tube wells	0.27	0.02
Chaff cutter	0.63	0.30
Winnower	0.41	0.16
Deshi plough	0.64	0.52
Others	2.33	1.84
Total	3.59	3.24

cent on non-tribal and tribal farms, respectively which is less than one. Similarly the regression coefficient for land preparation was also positive and significant in non-tribal farms but not for the tribal farm. The regression coefficient was found to be negative and non-significant in the tribal farms.

The positive regression coefficient for irrigation was observed for both the category of farms, indicating that irrigation affects significantly the yield of potato. Positive impact of fertilizer application on per hectare output was also observed for both the categories of farms. This indicate that 1 per cent increase in fertilizer application will result in an increase in yield by 0.363% and 0.112%, respectively in non-tribal and tribal areas. R^2 values i.e. 85% and 97.9% respectively for non-tribal and tribal farms establish the fact that explanatory variable included in the model are responsible for variation in output of potato over output of Mustard.

The regression coefficient of labour was found positive on the tribal farms. On the other side in case of non-tribal farms it was not found to significantly affecting the productivity of mustard. The production elasticity of labour shows that 1 per cent increase in the use of labour increases the productivity of mustard by only 0.002% respectively for the non-tribal areas which all most negligible.

Table 3: Per farm distribution of area under deferent crops

Crop	Non-Tribe		Tribe	
	Area (ha.)	%age	Area (ha.)	%age
Average size of farm	1.61			0.66
Paddy	1.19	74.20	0.53	80.63
Till	0.08	5.09	0.08	11.98
Arhar	0.07	4.46	0.04	6.42
Ratoon	0.07	4.22	0.00	0.00
Sugar cane	0.07	4.41	0.00	0.00
Fodder	0.12	7.62	0.01	0.97
Kharif	1.61	100.00	0.66	100.00
Wheat	1.04	64.88	0.55	83.29
Potato	0.06	3.49	0.01	1.11
Mustard	0.06	3.48	0.00	0.00
Pea	0.09	5.32	0.02	3.62
Gram	0.08	4.73	0.03	4.04
Fodder	0.08	5.13	0.01	1.52
Rabi	1.40		0.62	

Mustard

The table further revealed that production elasticity of land preparation was negative but non-significant for non-tribal farms which mean that the cost for land preparation has not been affecting the productivity of the mustard.On the other hand coefficient of irrigation was found positive in case of the tribal but negative for the non-tribal farms. It was also observed that irrigation has been affecting the yield of mustard of both the farms non-significantly. The calculated production elasticity of fertilizer application was found also found positive in case of non-tribal farms. It may be inferred, based on the coefficient of multiple determination (R^2), explanatory variable was responsible for 48% of variation in total

Table 4: Per farm Area, Production and Productivity of sample farm

Crops	Non- Tribe			Tribe		
	Area (ha.)	Production (qt)	Productivity(qt./ha.)	Area (ha.)	Production (qt)	Productivity(qt./ha.)
Cereals	2.23	55.0	25	1.08	23.0	21
Paddy	1.19	36.0	30	0.53	14.0	26
Wheat	1.04	19.0	18	0.55	9.0	16
Pulses	0.25	3.0	12	0.09	1.0	11
Pea	0.09	1.0	14	0.02	0.3	12
Gram	0.08	1.0	11	0.03	0.3	9
Arhar	0.07	1.0	9	0.04	0.4	9
Oil seed	0.14	1.4	10	0.08	0.3	3.75
Mustered	0.06	1.0	12	0	0.0	0
Till	0.08	0.4	5	0.08	0.3	3
Cash crop						
Ratoon	0.7	11.0	155		0.0	0
Sugar cane	0.07	11.0	161		0.0	0
Potato	0.06	7.0	121	0.01	1.10	111

Table 5: Cobb-Douglas production functions for major crops

Non-Tribes Crop	No.	Intercept	Labour	Land Preparation	Irrigation	Fertilizer	R^2 (%)
Wheat	63	2.837	-0.119	-0.457	0.034*(1.572)	0.084***(2.587)	68
Potato	19	0.670	0.204*(1.348)	0.129*(1.649)	0.018	0.363***(2.990)	85
Mastered	23	1.329	0.002	-0.144		0.061	49
Pea	31	0.500	-0.168	0.178	-0.014	0.361	32
Gram	38	0.687	0.093	0.063		0.052	20
Paddy	63	2.091	-0.838	0.018	0.178***(2.569)	0.188***(2.613)	86
Till	22	0.643	0.061	0.012			17
Arhar	20	0.274	0.242	0.145			38
Sugar cane	16	2.141	0.184*(1.361)	0.223	-0.158	0.148**2.114	39
Ratoon	18	0.798	0.295***(2.555)		-0.007	0.397***(2.663)	68

output of non-tribal farms.

Pea

The positive regression coefficient of labour for tribal farms and negative for non-tribal farms indicate that labour was not significantly affecting the productivity of pea in the selected villages during the period under study. On the other hand, production elasticity of land preparation was positive for both the farms but non-significant. It means cost made on land preparation by the selected respondents had not affecting the productivity of the pea significantly. The production elasticity of land preparation shows that 1 per cent increase in the use of land preparation (or cost of land preparation) increases the productivity of pea by 0.178% and 0.120% respectively for the non-tribal and tribal farms.

On examining the regression coefficient of irrigation, which was positive in case of the tribal farms but negative in case of the non-tribal farms and non-significant for both the groups. It means that yield of the pea in both the farms had been affected non-significantly. While studying the production elasticity of fertilizer application, it was found positive for both the farms but was not statistically significant too. It may be inferred based on the coefficient of multiple determinations (R^2) that the explanatory variable had been responsible for 32% and 27% variation in output per hectare of non-tribal as well as the tribal farms, respectively.

Gram

The production elasticity of labour was observed positive for cultivating gram in the tribal and non-tribal areas. The statically non-significant regression coefficient also indicates the insignificant labour contributions in the productivity of the gram for both the kind of farms. It also indicate that one per cent increase in the labour will contribute towards increase in productivity of gram by 0.093 and 0.005 per cent of non-tribal and tribal farms, respectively. The coefficients of production elasticity of land preparation were found positive but non- significant for both the farms which reflect that it affects the productivity of the gram. In other words it can be said that 1 per cent increase in cost of land preparation increases the productivity of gram by 0.0.063% and 0.061% respectively for the non-tribal and tribal farms.

The production elasticity of fertilizer application was found positive in case of both the farms but was statistically non-significant for tribal as well as non-tribal farms. Similarly the production elasticity of fertilizer shows that 1 per cent increase in the use of fertilizer cost increases the productivity of gram by 0.0.052% and 0.208% respectively for the non-tribal and tribal farms.

On the basis of coefficient of multiple determination (R^2) it could be inferred that the explanatory variable are responsible for 20% and 43% variation in productivity of gram of non-tribal as well as the tribal farms, respectively.

Paddy

The coefficient of human labour used in paddy production was associated with negative sign and production elasticity insignificant for both, tribal and non-tribal farms. Thereby, it can be concluded that the human labour was not critically influencing the production of paddy for both the groups. High availability of the family labour was the reason for non-significant nature of human labour. On the other hand positive coefficient of land preparation in the case of non- tribal and negative in the case of tribal farms but non-significant in both the cases signifies that cost made on land preparation had some impact on the production of paddy on tribal farms whereas it had no impact on non-tribal farms. But this impact was observed non-significant for both the groups.

For irrigation the regression coefficient was found positive and significant in both the cases whereas the production elasticity indicates that 1 per cent increase in cost of irrigation may increase the productivity of paddy by 0.178% and 0.098% , respectively in tribal and non-tribal farms. On the other side the production elasticity of fertilizer was found significant in both cases and had positive impact on yield per hectare. On the basis of the results it can be inferred that 1% increase in fertilizer application will result in an increase of 0.188 and 0.252 percent respectively in tribal and non-tribal farms. The coefficient of multiple determination (R^2) of the explanatory variable (labour, land preparation, irrigation and fertilizer) indicates that these factors were responsible for 85 and 75 percent variation on non-tribal and tribal farms, respectively.

Sesamum (Sesamum indicum)

Coefficient for labour was found positive and significant for both, tribal farm and non-tribal farms. In other words labour had not affected the productivity of sesamum significantly. On the hand analysis of production elasticity of land preparation revealed that productivity of the sesamum was affected positively for both the farms but it was fond non- significant. The production elasticity of land preparation shows that 1 per cent increase in the use of land preparation techniques increases the productivity of sesamum by 0.012 and 0.066 percent, respectively for the non-tribal and tribal farms. It may be inferred on the basis of coefficient of multiple determination (R^2) that the explanatory variable were responsible for 17 and 62 percent of variation in yield per hectare of sesamum crop on non-tribal as well as the tribal farms, respectively.

Tur (Cazanun casun)

Positive and significant regression coefficients of labour were found in case of both tribal and non-tribal farms which indicate that labour did not affected the productivity/ha of tur significantly. It was found positive, while examining, production elasticity of land preparation for both the groups of farms but they were non significantly effecting the productivity of the tur. The production elasticity of land preparation shows that 1 per cent increase in the cost made on land preparation techniques, increased the productivity of tur by 0.145 and 0.201 percent, respectively, for the non-tribal and tribal farms. It may be inferred, based on the coefficient of multiple determination (R^2), that the explanatory variable included in the regression model are responsible for 9 and 6 variation in yield per hectare of tur on non-tribal as well as the tribal farms, respectively.

Sugarcane:

The regression coefficient of labour, used for production of sugarcane by non-tribal farmers was found positive and significant. The production elasticity of labour indicates that one per cent increase in the cost of labour led to increase yield of sugarcane by 0.184 per cent on non-tribal farms.

The regression coefficients for land preparation and irrigation were also found positive but non-significant for non-tribal farms. In case of fertilizer, the impact of fertilizer on productivity of sugarcane was found positive and significant on non-tribal since the production elasticity of fertilizer were found positive and statistically significant. This indicates the 1percent increase in cost of fertilizer application would bring an increase in productivity per hectare of sugarcane by 0.148 percent on non-tribal farms.

Regarding explanatory variable (labour, land preparation, irrigation and fertilizer) it may be inferred, on the basis of coefficient of multiple determination (R^2) that these variables were responsible for 39 percent variation on non- tribe farms.

Ratoon:

The regression coefficient for labour use, were found positive and significant on non-tribal farms and thus production elasticity of labour indicates that one per cent increase in the cost of labour led to increase in yield of ratoon by 0.295 per cent on non-tribal farms. It is interesting to note that irrigation had negative and non-significant impact on the yield of ratoon on non-tribal farms.

On non-tribal farms the production elasticity of fertilizer application was found positive and significant which indicates positive impact on yield of ratoon. In other worlds it could be said that 1 per cent increase in the cost of fertilizer application increased the productivity per hectare of ratoon by 0.397% on non-tribal farms. Multiple determinations (R^2) of the explanatory variable were found responsible for 68 percent of variations in the yield of ratoon on non-tribal farms.

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