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***TECHNICAL CHANGE AND FUNCTIONAL INCOME
DISTRIBUTION IN PADDY PRODUCTION - A CASE STUDY
OF TRIBAL FARMS OF RANCHI DISTRICT, BIHAR (INDIA)***

Naresh Chandra and R.P. Singh

ABSTRACT

The new seed technology is said to affect different categories of farmers differently. The present paper attempts to determine and compare the relative and absolute factor shares for various inputs accruing to marginal, small and other categories of farms in Ranchi, a tribal dominated district of Bihar. The study revealed that new seed technology under rainfed condition was biased in favour of labour and against capital but was neutral to the use of land. There were gains in all the factors of production, but the per hectare gain to labour was the highest, followed by land and capital. However, gain from land by the large farmers will still remain higher than additional income of the small farmers by increased use of labour and capital. Therefore, adoption of new seed technology will not reduce the disparity in personal income distribution in the area which is dominated by small farmers commanding small proportion of total cultivated land.

INTRODUCTION

Introduction of high yielding varieties (HYV'S) of crops is one of the most important technological breakthroughs the Indian agriculture has experienced. However, a major part of cultivable land, especially inhabited by weaker sections of society (tribals), has not yet been covered by HYV crops. In order to mobilize the opinion of tribals in favour of HYV's and to make them adopt them, the variations in the level of inputs use and income resulting there from have to be studied in detail. Further, it is suggested that due to the adoption of the new seed technology, there is a significant change in the functional income distribution (Adinarayan, 1986). The validity of such arguments may be investigated by looking into the feasibility and economic viability of a particular technology and also the proper supply of the inputs

required in the area concerned. The present study attempts to make such a quantitative assessment to determine whether factors of production enjoy similar or dissimilar shares in total income under new seed technology on different categories of farms. The study was undertaken considering rainfed condition for both HYV and Local varieties of paddy.

MATERIALS AND METHODS

The study used the data collected from the tribal dominated Ratu Development Block of Ranchi District in Bihar, for the agricultural year 1985-86. A two stage random sampling design was used to select 120 cultivators (60 growing HYV's and 60 growing only local varieties of paddy), falling under different categories, viz., marginal (less than 1 hectare), small (1 to 2 hectares) and other (above 2 hectares). Following the conventional survey techniques, primary data on use and application of various inputs, production and prices of local and HYV's of paddy crop were collected by interviewing the farmers using especially structured and pre-tested questionnaires.

A tabular analysis was performed to study the costs and returns pattern for the local and HYV's of paddy grown on different categories of farms. Functional income distribution (relative factor shares) which reflects the proportion of total income that accrues to various factors of production employed in the production process, were estimated as follows :

If,

W_b = Total wage bill

K_b = Total capital bill

P_y = Total income from paddy crop,

then the shares of various factors of production are,

$\frac{W_b}{P_y}$ = Share of labour¹ in total income³

$\frac{K_b}{P_y}$ = share of capital² in total income

Land share is treated as residual and computed as

$$1 - \left(\frac{W_b}{P_y} + \frac{K_b}{P_y} \right)$$

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1. Labour includes only human labour
 2. Capital includes the expenses on seed, manures and fertilizers, plant protection measures and bullock labour charges, which includes charges for a pair of bullock and a ploughman.
 3. Total income includes value of main and by-products at 1985-86 prices

The proportionate rate of change in i^{th} factor share as a result of technological change is measured as :

$$D_i = \frac{(S_i)_H - (S_i)_L}{(S_i)_L}$$

Where, D_i is a measure of proportionate rate of change in i^{th} factor share ;

S_i is the income share (factor share) of factor i , and 'H' and 'L' subscripts refer to HYV and Local seed technology, respectively.

RESULTS AND DISCUSSION

Input Use and Yield

The per hectare use of all important inputs in growing local and high yielding varieties of (HYV's) paddy is given in Table 1. The total cost on various inputs used in the production of HYV's was much higher than that of local varieties of paddy. The higher cost of HYV's cultivation could be attributed mainly to higher level of use of manures and fertilizer and human labour. The relatively lower level of use of human labour in cultivation of HYV's paddy grown on very small fraction of land on marginal and small farms as compared to large farms was probably due to off-farm occupation supplementary to their needs. Among the various inputs, the share of human labour in the total inputs cost was maximum ranging from 70 to 73 percent in HYV's and from 68 to 70 percent for local varieties of paddy. This was followed by manures and fertilizers in HYV's, and bullock labour in local varieties. Seed is another important input. Its share in total inputs cost was observed to be much lower (4 percent) in HYV's as compared to 11 percent in local varieties of paddy. This was mainly due to lesser quantity of HYV's seeds used in the improved method (transplanting) of paddy cultivation, while traditional method (broadcasting) was followed in growing local varieties of paddy.

The average total cost of inputs per hectare was nearly Rs. 1,795 for HYV's and Rs. 1,302 for local varieties of paddy. Though the yield per hectare of HYV's was nearly one and a half times greater than that of local varieties of paddy, but due to higher input cost associated with HYV's cultivation the output input ratio appeared to be almost same for both the varieties of paddy cultivation. The comparison among different size groups revealed that the marginal farmers gained the maximum in terms of Gross Income, followed by small and other size groups from both the varieties cultivated in the studied area.

Functional Income Distribution

Table 2 gives the direction and percentage of difference in factor shares in paddy production between high yielding and local varieties on different farm size groups. The

results reveal that the relative share of land was the highest in both the varieties, followed by labour and capital. In the land-scarce and labour-abundant tribal agriculture of Ranchi, the new seed technology could provide opportunity for significant productivity increases through land-augmenting, labour-using and capital-saving technologies. A comparative look at the relative factor shares indicates that the share of land was almost same in both the varieties being slightly higher for HYV's (0.30 percent). The share of labour was 4 percent higher, while that of capital 11 percent lower for high yielding varieties compared to local varieties. This showed that the new seed technology was biased in favour of labour and against capital, but was neutral to the use of land. The gain in the share of labour could mainly be attributed to more extensive use of this input in HYV's paddy cultivation. In other words, the adoption of new seed technology in rainfed tribal agriculture would generate employment opportunities. The decrease in the share of capital by adoption of new seed was mainly due to greater increase in income compared to the increase in expenditure in adopting the new seed technology.

Absolute shares of each factor of production was computed by multiplying the actual factor share with the gross income (Table 3). The results reveal that all the factors (land, labour and capital) gained under new seed technology in absolute terms, but the percentage increase in absolute share of labour in gross income (44 percent) was greater than that in absolute capital share (24 percent). Percentage increase in income from land (37 percent) which would mainly go to the large sized farms, is less than that from labour which is available in plenty on smaller farms. The change in income by increased use of

TABLE 1. BREAK-UP OF TOTAL INPUT COST OF CULTIVATION PER HECTARE OF HIGH YIELDING AND LOCAL VARIETIES OF PADDY ON SAMPLE FARMS.

Items of cost	HYV's paddy				Local paddy			
	Marginal	Small	Others	All farms	Marginal	Small	Others	All farms
1. Human labour Level of use (Rs/ha) Share in total cost (%)	1248.30 70.02	1274.66 72.00	1325.60 73.11	1295.50 72.19	920.93 70.31	901.28 68.76	876.54 68.79	899.58 69.11
2. Bullock labour Level of use (Rs/ha) Share in total cost (%)	163.57 9.17	170.56 9.63	169.94 9.37	168.85 9.40	149.11 11.38	153.25 11.69	147.09 11.54	149.81 11.50
3. Seeds Level of use (Rs/ha) Share in total cost (%)	78.33 4.39	79.56 4.49	72.97 4.02	75.94 4.23	142.89 10.91	146.08 11.14	139.98 10.98	142.98 10.98
4. Manures and fertilizers Level of use (Rs/ha) Share in total cost (%)	268.37 15.05	218.66 12.35	226.05 12.46	232.35 12.94	81.13 6.19	91.73 6.99	94.59 7.42	92.48 7.10
5. Plant protection Level of use (Rs/ha) Share in total cost (%)	24.02 1.34	26.74 1.51	18.39 1.01	21.92 1.22	15.57 1.18	18.32 1.39	15.98 1.25	16.72 1.28
6. Total input cost	1782.59	1770.18	1812.95	1794.56	1309.63	1310.66	1274.18	1301.57
7. Yield (qt/ha)	20.18	19.62	18.23	19.55	13.05	12.98	12.53	12.61
8. Gross income	4777.58	4701.57	4562.99	4680.71	3410.97	3402.72	3392.34	3402.01
9. Output/input ratio	2.68	2.65	2.51	2.60	2.60	2.59	2.66	2.61

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TABLE 2. RELATIVE FACTOR SHARES IN LOCAL PADDY (NON-ADOPTER) AND HYV'S PADDY PRODUCTION ON DIFFERENT CATEGORIES OF FARMS.

Adoption/Size group	Relative share in gross income		
	Land	Labour	Capital
HYV's paddy			
Marginal	0.628	0.261	0.111
Small	0.624	0.271	0.105
Others	0.604	0.290	0.106
All farms	0.620	0.275	0.105
Local varieties of paddy			
Marginal	0.632	0.269	0.099
Small	0.616	0.264	0.120
Others	0.625	0.258	0.117
All farms	0.618	0.264	0.118
Percentage change (HYV's Vs. local varieties)			
Marginal	(-)0.63	(-)2.97	(+)12.12
Small	(+)1.29	(+)2.65	(-)12.50
Others	(-)3.36	(+)12.40	(-) 9.40
All farms	(+)0.32	(+)4.16	(-)11.01

TABLE 3. ABSOLUTE FACTOR SHARES IN LOCAL PADDY (NON-ADOPTER) AND HYV_s PADDY PRODUCTION ON DIFFERENT CATEGORIES OF FARMS.

Adoption/size group	Absolute share per hectare in gross income		
	Land	Labour	Capital
HYVs paddy			
Marginal	3000.32	1248.30	534.29
Small	2933.77	1274.66	495.52
Others	2756.04	1325.60	487.35
All farms	2892.67	1295.50	499.06
Local varieties of paddy			
Marginal	2155.73	920.93	388.70
Small	2096.07	901.28	409.38
Others	2120.21	876.54	397.64
All farms	2102.42	899.58	401.89
Percentage change (HYVs vs. Local varieties)			
Marginal	39.17	35.65	37.62
Small	39.96	41.39	21.02
Others	29.98	51.25	22.67
All farms	37.58	44.04	24.43

labour and capital of small farms will not be compensated by the increased income generated by larger acreage of large farms. This may mean a wide income inequality in the area which is dominated by smaller farms (40 percent) commanding a small proportion (16 percent) of the total net cultivated area.

CONCLUSIONS

The functional income distribution effect of new seed technology under rainfed condition was biased in favour of labour and against capital, but was neutral to land. There was gain in all the factors of production, but the per hectare gain to labour was the highest, followed by land and capital. However, gain from land by the large farmers will still remain higher than additional income of the small farmers by increased use of labour and capital. This indicates that the disparity of personal income distribution in the area which is dominated by small farmers commanding small proportion of total land, will not be reduced by the adoption of new seed technology.

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