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Resource Use Efficiency in *Waingani* Paddy Cultivation in Sindhudurg District of Maharashtra

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Abstract: *The present study entitled, 'Economics of* waingani *paddy cultivation in Sindhudurg District.' was undertaken with 120 farmers randomly selected from Sindhudurg district (M.S.).The data collected pertained to agricultural year 2014-2015.The selected sample farmers were classified into two groups according methods of paddy cultivation. These two groups were categorized as rahoo method and transplanting method.As regards to inputs resource efficiency, seed was found to be excess utilized in the both the methods. This revealed scope for proper allocation of resources in* waingani *paddy cultivation in both the methods.In both the methods decreasing returns to scale were observed in the cultivation of* waingani *paddy. However, most of the inputs were observed to be used in excess quantity as their marginal value productivity was far below to respective factor cost. The cent per cent farmers opined that labour problem was serious at the time of transplanting with higher labour wages.*

Keywords*: Resource use efficiency,paddy, returns to scale.*

INTRODUCTION

In India, paddy is the only promising crop to acquire self sufficiency in foodgrain production for the increasing population. Paddy crop occupies the largest cultivated land in the country. It was cultivated on an area of 43.95 mha with the production of 106.54 million tones in the year 2013-14 (*Agricultural Statistics at a Glance, 2014,* Directorate of Economics and Statistics, Ministry of Agriculture, GOI). Technology break through in the field of agriculture has resulted in the spectacular performance in paddy production in the country, but with regards to average productivity, compared to other Asian countries, the production of paddy per unit of land (productivity) is very low in India.

METHODOLOGY

The maximum area under summer paddy cultivation is concentrated in Sindhudurg district of Konkan region therefore; Sindhudurg district was selected purposively.Malvan, Kudal and Sawantwadi tahsils of Sindhudurg district were selected, having maximum area under summer paddy cultivation.For the selection of villages, from each tahsils two villages were selected purposively having maximum area under summer paddy.The list of summer paddy cultivators was obtained from revenue records of selected villages. From each village 20 sample farmers were selected randomly. The data were collected from the selected paddy growers by personal interview method.In Sindhudurg district, it is observed that summer paddy is cultivated near river and nallas where natural water logged condition exist during November to February. If necessary protective irrigation is given .The farmers were cultivating paddy by two method namely rahoo method and transplanting method. Therefore, farmers were grouped according to method of cultivation of paddy to know the economics of both the method. In rahoo method the seed of paddy is soaked in

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water for 2-3 days and then directly broadcasted in the field. After broadcasting of sprouted seed the standing water level about 1 to 2 cms is maintained to set the seedlings of paddy. In transplanting method, seedlings are raised on nursery bed and after 35 to 40 days seedlings are uprooted and transplanted in field. The summer paddy in Sindhudurg district locally called as *Waingani* paddy.

Functional Analysis

For study the resource use efficiency particularly *waingani* paddy cultivation, Cobb- Douglas production function was used.

$$Y = a\, x_1^{b1} x_2^{b2} x_3^{b3} x_4^{b4} x_5^{b5} x_6^{b6} x_7^{b7} e^u$$

Where,

Y = Yield in (q)

X_1 = Human labour days (X_1)

X_2 = Seeds in kg. (X_2)

X_3 = Bullock Labour days(X_3)

X_4 = Manures in kg (X_4)

X_5 = N in kg (X_5)

X_6 = P in kg (X_6)

X_7 = K in kg (X_7)

(X_8) = Pesticide in lit (X_8)

e^u = Error term

Estimating marginal physical productivity (MPP)

The MPP of particular resource was estimated by taking first order partial derivative of output with respect to each input by using the following method.

$$\frac{dy}{dx_1} = b_i \frac{\bar{Y}}{\bar{X}_1}$$

Where,

$$\frac{dy}{dx_1} = b_i \frac{MPP\ of\ X_1}{Production\ elasticity\ of\ x_1}$$

X_1 = Geometric mean of X_1

Y = Geometricmean of Y

Likewise MPP of i^{th} input was estimated.

Estimating of marginal value product (MVP)

The marginal value of the product of each input was calculated by multiplying the marginal physical product of input by price per unit of output.

MVP of xi = (MPP of xi) X (per unit price of Y)

For knowing resource use efficiency, MVP of resource was then compared with per unit cost of resource i.e. ratio of MVP to factors price, as

$$\text{Input factor price} \frac{\text{MVP}}{} \begin{cases} > 1, \text{Under utilization resources} \\ 1, \text{Optimum use of resources} \\ < 1, \text{Excess utilization of resources} \end{cases}$$

RESULT AND DISCUSSION

Elasticity coefficients of inputs

The Cobb- Douglas production function was fitted to input-output data as described in the methodology. The estimated elasticities of different inputs are given in Table 1

It is evident from the Table 1 that in Rahoo method, elasticity of bullock labour was found to be highest 4.4291 and significant at 5 per cent probability level and human labour was found to be -4.8278 and significant at 5 per cent probability level. The production elasticity with respect to nitrogen was 0.5861, but turned out to be non-significant. Whereas production elasticity of manures and was found to be negative and significant.

In case of rahoo method the sum of elasticity's was found to be 0.9055, which indicates more or less constant returns to scale in the cultivation of paddy. The R^2 value 0.81 indicates about 81 per cent variation in yield of *waingani* paddy was explained by the explanatory variables indicated in the function.In case transplanting method, the production elasticity of seeds was found to be highest 0.2352 and significant at 5 per cent probability level and potash was found to be 0.1908 and significant at 5 per cent probability level. The production elasticity with respect to human labour,

Table 1
Elasticity coefficients of inputs

Sr. No	*Input variables*	*Rahoo Method*	*Transplanting method*
1.	Constant (Intercept)	2.1742	-1.3053
2.	Human labour days (X_1)	-4.8278*(1.0929)	0.2151(0.1434)
3.	Seeds in kg. (X_2)	1.7775*(0.6848)	0.2352*(0.0877)
4.	Bullock Labour days(X_3)	4.4291(0.9907)	0.0956(0.1391)
5.	Manures in kg (X_4)	-2.6863*(1.0478)	0.1029(0.0822)
6.	N in kg (X_5)	0.5861(1.2700)	0.1377(0.1574)
7.	P in kg (X_6)	-2.2668*(0.9544)	0.1344(0.1322)
8.	K in kg (X_7)	3.0596*(0.7304)	0.1908*0.0813
9.	Plant protection in Rs (X_8)	0.8341*(0.2797)	-0.1174(0.1493)
	Sum of elasticities	0.9055	0.9946
	Adjusted R^2	0.81	0.62

* Significant at 5 per cent level of profitability

Table 2
Resource use efficiency in *waingani* paddy cultivation: Rahoo method

Sr. No.	*Resources*	*MVP(Rs.)*	*Factor cost (Rs.)*	*MVP/Px*	*Resource use efficiency*
1.	Human labour days (X_1)	-57.1429	254.76	-0.2243	Excess utilization
2.	Seeds in kg. (X_2)	16.7832	20.29	0.8271	Excess utilization
3.	Bullock Labour days(X_3)	246.9769	612.19	0.4034	Excess utilization
4.	Manures in kg (X_4)	-17.5499	3.00	-17.5498	Excess utilization
5.	N in kg (X_5)	267.0892	19.92	13.4080	Under utilization
6.	P in kg (X_6)	9.85167	18.37	0.5362	Excess utilization
7.	K in kg (X_7)	-153.845	36.43	-4.2230	Excess utilization
8.	Plant protection in Rs.(X_8)	111.7298	500	0.2234	Excess utilization

bullock labour, manure cost was positive, but turned out to be non-significant. This indicated negligible impact of these variables including farm size on production of rice. In case of transplanting method the sum of production elasticities was 0.9946. The variation in the yield of paddy in transplanting method explained by all the independent variables was 0.62 per cent as indicated by R^2 value.

The efficiency of resources used in paddy cultivation was then tested with the help of ratio of marginal value productivity of resources to its unit cost (factor cost). The analysis of resource use efficiency was carried out separately for each method and the results are presented in Table 2, 3 for rahoo method and transplanting method respectively.

It is observed from Table 2 that, is in case of Rahoo method paddy cultivation, MVP/Px was greater than one for N (X_5). This means N was under utilized, while this ratio for human labours (X_1),Seeds (X_2), Bullock labour (X_3), Manures (X_4), P (X_6),K (X_7), andplant protection (X_8) was less than one. This indicated that the use of these resources was in excess quantity.

From Table 3, it is evident that, in case of transplanting method, MVP/Px was greater than unity in case of, manures (X_4), N (X_5), K ((X_7) and Plant Protection(X_8) This means manure (X_4), N (X_5), P(X_6, P(X_6) and K(X_7) were under utilized, while this ratio for human labours(X_1), seeds (X2), Bullock Labour (X_3), less than unity indicating excess utilization of these four resources.

Table 3
Resource use efficiency in *waingani* paddy Cultivation: Transplanting method

Sr. No.	*Resources*	*MVP(Rs.)*	*Factor cost (Rs.)*	*MVP/Px*	*Resource use efficiency*
1.	Human labour days (X_1)	49.3354	257.23	0.1917	Excess utilization
2.	Seeds in kg. (X_2)	9.5978	18.87	0.5086	Excess utilization
3.	Bullock Labour days (X_3)	497.5738	620.33	0.8021	Excess utilization
4.	Manures in kg (X_4)	13.3736	3.00	4.4578	Under utilization
5.	N in kg (X_5)	46.2097	17.68	2.6136	Under utilization
6.	P in kg (X_6)	182.4426	35.78	5.0990	Under utilization
7.	K in kg (X_7)	366.499	18.32	20.0054	Under utilization
8.	Plant protection in Rs. (X_8)	82.689	500	1.6537	Under utilization

CONCLUSIONS

In case of rahoo method 81 per cent variation in yield was explained by all inputs, while 62 per cent variation in yield was explained by all inputs in transplanting method.In case of rahoo method human labour, seeds, bullock labour, manures, P, K were excess utilized while; N Fertilizer and plant protection were underutilized.In transplanting method human labour, seeds, bullock labour, manures, and K fertilizer were excess utilized while, manure N fertilizer, plant protection were underutilized.The majority of farmers in both methods experienced the problem of high bullock charges, high cost for nutrients, non-availability of labour for harvesting, lack of knowledge of pests. Whereas cent per cent farmers in transplanting method opined that the non-availability of labour for transplanting, and high wage rate for labour.

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