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A Study On Crop Productivity With Special Reference To Paddy Crop- A Study

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ABSTRACT

The present paper deals with the resource use and crop productivity with special reference to paddy crop in Karimnagar district of Telangana. An attempt has been made to discuss the resource-use and productivity of different farms with the help of production function analysis in different crops. The resource factors like human labour, bullock labour, manures and fertilizers, pesticides, working capital, seeds and irrigation play an important role in crop production and hence they are considered for the present study. The present paper has been divided into three sections. Section-I deals with the importance of the resource use and productivity of agriculture. Section-II deals with the objectives and methodology. Findings and conclusions of the study had been presented in Section-III. The study is mainly based on the data gathered from primary and various secondary sources.

Keywords: Resource use, Crop Productivity, Paddy Crop

1. INTRODUCTION

The term resource use efficiency in agriculture may be broadly defined to include the concepts of technical efficiency, allocative efficiency and environmental efficiency. However, there are countless studies showing that farmers often use their resources sub-optimally. While some farmers may attain maximum physical yield per unit of land at high cost, some others achieve maximum profit per unit of inputs used. Also in the process of achieving maximum yield and returns, some farmers may ignore the environmentally adverse consequences, if any, of their resource use intensity.

Logically all enterprising farmers would try to maximize their farm returns by allocating resources in an efficient manner, but as resources (both quantitatively and qualitatively) and managerial efficiency of different farmers vary widely, the net returns per unit of inputs used also vary significantly from farm to farm. Also a farmer's access to technology, credit, market and other infrastructure and policy support, coupled with risk perception and risk management capacity under erratic weather and price situations would determine his farm efficiency. Moreover, farmer knowingly or unknowingly may over-exploit his land and water resources for maximising farm income in the short-run, thereby resulting in soil and water degradation and rapid depletion of ground water, and also posing a problem of sustainability of agriculture in the long-run. In fact, soil degradation, depletion of groundwater and water pollution due to farmers managerial inefficiency or other-wise, have a social cost, while farmers those who forego certain agricultural practices which cause any such sustainability problem may have a high opportunity cost. The measure of resource-use efficiency is provided by the ratio of marginal value product to factor cost or acquisition cost. The resource is said to be allocated efficiently

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if the marginal value product of resource is equal to the factor cost of the resource (Haque, 2006).

After Independence, Irrigation potential in India has increased from 22.6 million hectares in 1951 to about 106 million hectares in 2009. India's ultimate irrigation potential has been estimated to be 139.5 million hectares. Even after achieving the full irrigation potential, nearly 50 per cent of the total cultivation area will remain rain-fed (Dehadrai P.V., 2008). The actual utilization in 2006-07 was only 87.2 million hectares which is only 62.3 per cent of the potential. In 1950-51the gross irrigated area as a percentage of gross cropped area was only 17 per cent. The same was only 45.3 per cent in 2009-10. The consumption of fertilizers which was only 2.9 lakh tonnes in 1960-61 shot up to 240 lakh tonnes in 2013-14. As per as distribution of quality seeds, it increased from 25 lakh quintals in 1980-81 to 283.8 lakh quintals in 2011-12. Though the statistics mentioned in previous lines giving a big picture of agriculture resource usage the efficiency is to be addressed by the ratio of marginal value product to factor cost of the resource.

Many production economists are not in full accord to the inefficiency in agriculture. They are in general of the view that inefficiency does exist. The causes of inefficiency in the use of agricultural resources are found due to the gap between costs and returns of agricultural product (Takale, 2005). Some of the important causes of inefficiency of resource-use are discussed below.

The knowledge of alternative techniques and resource organizations is important to explain as to why farmers individually do not maximize the value of product from given resources. The farmers lack the knowledge of soil conservation, crop varieties, fertilizers and efficient use of inputs. The knowledge of farmers is generally less in low income areas than in the highly efficient farming localities. Indian farmers have less knowledge about seeds, modern cultivation, fungicides and other insecticides as well as how and where to test the soil. His farming soil is composed of different kinds of minerals and components and in this case farmers have less or absolutely no knowledge about it.

There is an uncertainity of rain and capital in agriculture. Indian agriculture depends on rainfall. Therefore, it can be said that the Indian agriculture is a gamble of rains. The imperfections of the capital market with the firm, household in many particular farms are not employed more intensively in agriculture. National economical fluctuations and seasonal fluctuations are the two main causes of uncertainity. The optimum utilization of resources cannot be done due to uncertainity of production and prices of agricultural commodities. Resources use efficiency cannot increase due to lack of capital.

The production of agricultural sector is used for industrial sector, so agriculture is generally considered as a primary industry. If there are common elements in resource returns the agriculture production falls. The technical development and growth of population has interrelationship. The rate of population growth may affect agriculture and the value productivity of agricultural resources. Population growth for a nation as a whole may interact with the technical advance to cause resource return to decrease. The demand for and supply of the factor of production in agricultural sector does not equally change. So the resource-use efficiency for the factors of agricultural products cannot increase due to unequal changes in supply and demand. Therefore, in agricultural sector the resource use becomes inefficient.
In agricultural sector, there are different prices of factor inputs. In some regions, the prices of factor inputs are low and in some regions the prices of factor inputs are very high. The prices

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of land, family labour, hired labour and capital are different, hence the inefficiency increased. The value of marginal productivity of labour is lower in the region of good soil than in the region of poor soil. In this way these are the causes of resource- use inefficiency in agriculture.

Cropping patterns are determined in large measure by agro-climatic factors: soil, temperature and rainfall distribution, i.e., the physical conditions of a region. Crops suited to the given conditions are grown, resulting in what can be considered the traditional cropping pattern of the region. Generally, agro-climatic factors are fairly stable over time, while demographic, social and economic factors are less so, particularly in the present context of rapid induced change. Thus, while agro-climatic factors determine the conditions under which crops are grown, farmers are increasingly inclined to change cropping patterns in response to changes in economic factors (input and output prices), technological factors (improved seeds and irrigation), institutional factors (market and road density, and access to credit), and policy-induced factors (fertilizer and irrigation subsidy, procurement prices, etc.). The aggregate effects of the decisions of individual farmers establish new cropping pattern in the region, which becomes visible in the long-run (Gulati and Kelley, 2001). In this regard, it is an important to say that a key element in assessing acreage responses of the major crops to variations in own and competing crop prices and yields, input prices and various non-price or non-profit related factors- rainfall, irrigation, market access, and subsistence requirements.

2. THE OBJECTIVES OF THE STUDY ARE AS FOLLOWS

- to examine the resource-use and productivity of the crop like paddy in the study area; and
- to analyse the relative contribution of the inputs used on the yield per acre of the crops like paddy.

For this, the research design adopted in the study is an analytical one where both data from primary as well as secondary sources had been collected. The district of Karimnagar having five revenue divisions (Karimnagar, Peddapally, Huzurabad, Jagtial and Manthani) is located in Telangana is selected. The stratified random sampling method had been adopted for the selection of villages. Altogether, six villages had been taken up for the study. In each village 40 sample households have been chosen at random. Altogether, three mandals, six villages and 240 sample households had been selected for the study. The statistical techniques like regression analysis had been taken-up.

3. ANALYSIS OF THE STUDY

The multiple regression analysis had been carried out to know about the influence of the values of the labour cost per acre (LCACRE), manure cost per acre (MCACRE), seed cost per acre (SCACRE), fertilizer cost per acre (FCACRE), pesticide cost per acre (PCACRE) and hire cost of the machines per acre (HCACRE) on the dependent variable of the different crops' yield per acre for the overall sample size in the study area of the Karimnagar district. In the study area, respondent farmers are growing one crop namely; paddy. For this crop, regressions are worked out and for carrying out the analysis step-wise method had been chosen.

The summary statistics of paddy had been presented in **Table-1.** The results of the multiple regression analysis for the paddy crop had mentioned here under. As per the results of multiple regression analysis, only two explanatory variables-hire cost of the machines per acre and seed cost per acre were found to be statistically significant. And other explanatory variables are

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excluded from the model, because the 't' and 'F' values were not found to be statistically significant. And in a way, it can be said that the excluded variables from the model are not explaining any variation in the dependent variable of yield per acre of the paddy crop. While looking at the results, the initial R-square is 0.112 when hire cost of the machines taken as a predictor. And in the latter case when the inclusion of another predictor seed cost per acre, the R-square value has improved from 0.112 to 0.283. Here, the R-square change is 0.170. Therefore, it can be said that this model fit gives better fit. In the first equation, the F value is worked out to be 21.519 and in the case of second equation, the F value has increased from 21.159 to 40.147. The significant of F change was found to be statistically significant. The explanatory variable hire cost is explaining the 11.20 per cent of variation in the dependent variable. And the inclusion of seed cost as a predictor the increase of R-square is found to be of 0.170.

TABLE 1
STATISTICS OF MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.335[a]	.112	.107	7.943279	.112	21.159	1	170	.000
2	.532[b]	.283	.274	7.161405	.170	40.147	1	169	.000

a. Predictors: (Constant), HCACRE
b. Predictors: (Constant), HCACRE, SCACRE

TABLE 2
FINDINGS OF ANOVA[C,D]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1357.781	1	1357.781	21.519	.000[a]
	Residual	10726.265	170	63.096		
	Total	12084.047	171			
2	Regression	3416.760	2	1708.380	33.311	.000[a]
	Residual	8667.287	169	51.286		
	Total	12084.047	171			

a. Predictors: (Constant), HCACRE
b. Predictors: (Constant), HCACRE, SCACRE
c. Dependent Variable: Yield per acre
d. Selecting only cases for which type of crop=paddy

TABLE 3
NUMERICAL VALUES OF THE STANDARDIZED AND UNSTANDARDIZED COEFFICIENTS[A,B]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std.Error	Beta		
1 (Constant)	15.643	1,939		8.069	.000
HCACRE	.003	.001	.335	4.639	.000
2 (Constant)	22.650	2.068		10.951	.000
HCACRE	.005	.001	.542	7.440	.000
SCACRE	-.016	.002	-.462	-6.336	.000

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a. Dependent Variable: yield per acre
b. Selecting only cases for which type of crop = paddy

The numerical values of the unstandardized and standardized coefficients and their standard errors and the t-values were presented in **Table-3.** From the computed values of the 't' given in the Table, it can be said that all the t-values of the regression equations were found to be statistically significant. But in the case of second equation, both the standardized and unstandardized co-efficient of the B-value of the seed cost is negative and these negative values also reflect the negative 't' values. Despite, all the 't' values were found to be statistically significant. By and large, the estimates obtained by running through the step-wise regression analysis, all the estimates were found to be statistically significant.

TABLE 4
DESCRIPTIVE STATISTICS (A) (N=172)

Variable	Mean	Std. Deviation	CV
Yield per acre	24.18605	8.406363	34.75699
LCACRE	3973.8372	3818.36208	96.08741
MCACRE	2148.8372	3280.40859	152.6596
SCACRE	783.2849	247.52880	31.6014
FCACRE	2587.9402	989.42363	38.23211
PCACRE	1507.7243	922.24386	61.16812
HCACRE	3011.9186	993.42955	32.98328

a Selecting only cases for which type of crop = paddy

Table-4 deals with the descriptive statistics of mean, standard deviation and the co-efficient of variation (or) of the dependent variable and the explanatory variables included in the model. The mean value of yield per acre is worked out to be of 24.18605, its standard deviation is 8.406363 and the CV is 34.75699. In this case, one can say that there is a wide spread dispersion among the sample households. The mean value of the labour cost per acre is worked out to be 3973.8372, its standard deviation and co-efficient of variation are worked out to be 3818.36208 and 96.08741 respectively. In this case, one can say that there is a wide spread variation among the sample households. The mean value of manure cost per acre is 2148.8372, its standard deviation is 3280.40859 and its CV is worked out to be 152.6596. Therefore, it can be said that there is a wide variation among the sample households. The mean value of seed cost per acre is worked out to be 783.2849, its standard deviation is worked out to be 247.52880 and its CV is 31.6014, and in this case there is no much variation among the sample households. The mean value of fertilizer cost per acre is 2587.9402, its standard deviation is 989.42363 and the CV is 61.16812. In this regard, there is a wide spread dispersion among the sample households. In the case of pesticide cost per acre, the mean value its standard deviation and CV are worked out to be 1507.7243, 922.24386 and 61.16812 respectively with which one can say that there is much variation among the sample households. And finally, in the case of hire cost per acre, the mean value is worked out to be 3011.9186, its standard deviation is 993.42955 and the CV is 32.98328 and therefore, it can be said that there is dispersion among the sample households in the study area.

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TABLE 5
INTER-CORRELATIONS (A) (N=172)

Model	Variable	yield per acre	LCACRE	MCACRE	SCACRE	FCACRE	PCACRE	HCACRE
Pearson Correlation	Yield per acre	1.000 (-)	.161 (.018)	.222 (.002)	-.219 (.002)	.204 (.004)	.250 (.000)	.335 (.000)
	LCACRE	.161 (.018)	1.000 (-)	.808 (.000)	.116 (.066)	.256 (.000)	.277 (.000)	.227 (.001)
	MCACRE	.222 (.002)	.808 (.000)	1.000 (-)	-.049 (.260)	.157 (.020)	.194 (.005)	.193 (.006)
	SCACRE	-.219 (.002)	.116 (.066)	-.049 (.260)	1.000 (-)	.396 (.000)	.023 (.382)	.448 (.000)
	FCACRE	.204 (.004)	.256 (.000)	.157 (.020)	.396 (.000)	1.000 (-)	.862 (.000)	.560 (.000)
	PCACRE	.250 (.000)	.277 (.000)	.194 (.005)	.023 (.382)	.862 (.000)	1.000 (-)	.338 (.000)
	HCACRE	.335 (.000)	.227 (.001)	.193 (.006)	.448 (.000)	.560 (.000)	.338 (.000)	1.000 (-)

a. Selecting only cases for which type of crop = paddy
Note: Figures in parantheses indicate the level of significance.

Table-5 deals with the inter-correlations between the variables considered for the entire study area. The variable yield per acre of paddy crop is positively related to the variables like, labour cost per acre, manure cost per acre, fertilizer cost per acre, pesticide cost per acre and hire cost per acre. The correlations are very much significant in the case of variables like pesticide cost per acre and hire cost per acre. Whereas manure cost per acre, seed cost per acre and fertilizer cost per acre were found to be statistically significant at 5 per cent level. The variable yield per acre is negatively related to the seed cost. The variable labour cost per acre is positively related to the variables like yield per acre, labour cost per acre, manure cost per acre, seed cost per acre, fertilizer cost per acre, pesticide cost per acre and hire cost per acre. The correlation is very much significant in the case of variables like, manure cost per acre, fertilizer cost per acre, pesticide cost per acre and hire cost per acre. The correlation co-efficient is not found to be significant in the case of yield per acre and seed cost per acre. The correlation between labour cost per acre and manure cost per acre is very strong, while remaining variables correlation values are weak. The variable manure cost per acre is positively associated with variables like, yield per acre, labour cost per acre, fertilizer cost per acre, pesticide cost per acre and hire cost per acre. Correlation between manure cost per acre and labour cost per acre is very strong, whereas correlation with other variables is weak. Among these, yield per acre, labour cost per acre, pesticide cost per acre and hire cost per acre are having significant correlations. The variable manure cost per acre is negatively related to seed cost per acre and correlation between the variables is not statistically significant. The variable seed cost per acre is positively related to the variables like, labour cost per acre, fertilizer cost per acre, pesticide cost per acre and hire cost per acre. The correlation between labour cost per acre and all the variables is very weak. Among positively correlated variables, yield per acre, fertilizer cost per acre and hire cost per acre are having the significant correlations. The variable is negatively related to the variables like, yield per acre, manure cost per acre and these variables' correlation is very weak.

Among these, yield per acre's correlation is significant and seed cost per acre is not found to be significant. The variable fertilizer cost per acre is positively related to all the variables chosen

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for the analysis. The correlation between fertilizer cost per acre and pesticide cost per acre is very strong and hire cost is moderate and remaining variables' correlations are weak. Among these variables, all the variables are very much significant except manure cost per acre. The variable pesticide cost per acre is positively associated to all the variables considered for the study. The correlation between pesticide cost per acre and fertilizer cost per acre is very strong and other variables' correlation values are weak. Among positively correlated variable, yield per acre, labour cost per acre, manure cost per acre, fertilizer cost per acre and hire cost per acre are having the significant correlations except seed cost per acre. The variable hire cost per acre is positively related to the variables like yield per acre, labour cost per acre, manure cost per acre, seed cost per acre, fertilizer cost per acre and pesticide cost per acre. There is a moderate correlation between hire cost per acre and fertilizer cost per acre and other variables' correlation values are low. Among these variables, all the variables' correlation co-efficient values were found to be statistically significant.

By and large, the preceding analysis leads us to draw the broad inference as mentioned here. The resource factors like human labour, bullock labour, manures and fertilizers, pesticides, working capital, seeds and irrigation play a vital role in crop production and hence they are considered in the present study.

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