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Resource Use Efficiency of Supermarket Supply Vegetable Farmers vs Traditional Market Supply Farmers of Rangareddy and Medak districts of Andhra Pradesh-A Comparison

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ABSTRACT

The present study examines the resource use efficiency in tomato, brinjal and bhendi production by supermarket and traditional market supplying farmers in Rangareddy and Medak districts of Andhra Pradesh. The data for the study were collected from 234 farmers who were supplying vegetables to supermarket and 234 farmers who were supplying to traditional markets. Cobb-Douglas production function was used to estimate the production function of the vegetables farmers and their efficiency in resource use separately for the two groups of farmers. The results revealed that the traditional market supplying farmers display inefficient use of available resources and the results indicated that the farmers would increase farm productivity by the use of adequate capital-intensive input levels in order to maximize their efficiency. However, in order to achieve the use of capital intensive inputs, farmers should be encouraged to form groups/associations and linking with supermarket channel will enhance appropriate adjustment for optimum allocation of resources to maximize their revenue.

Key words : Comparison, Resource, Vegetable farmers

India is the second largest producer of vegetables, next only to China, covering an estimated area of 5.9 million hectares with a production of 90.8 million tones.

Most organized food retail ventures are involved in arrangements of procurement without any contracts or commitments, apart from paying farmers a remunerative price for the produce (Suleiman et al, 2010). However, there were reports that some retailers providing farmers some knowledge like ITC's Choupal fresh stores (retail outlets for fruits and vegetables) that have initiated backed by extension services, including demonstration plots and advice on crop calendars and cultivation techniques and practices, as well as cold chain support and other services (Gulati et al, 2008). Reliance India's largest corporate agency involved in organized food retailing and has committed large-scale investments to supply chain infrastructure development. There remains the possibility that with the role of corporate body in the active place, innovation support services to farmers (technology, inputs, etc.) may form a viable and necessary element of the mode of retailing.

To cater the needs of the supermarkets less perishable commodities were procured from the farmers by setting up of collection centers in the niche production regions. The procurement officers provide technical support to the member farmers in preparation and planning of crop calendar and show schedules to get the desired supply on a regular basis. Hence, resource productivity, allocation efficiency, and sound strategic resource use practices are important factors into predict for the coming necessary structural changes in the farm sector and in designing public policies that increases farmers' opportunity of using resources efficiently. Under this premises, an attempt was made to analyze the resource-use efficiency of the two groups of vegetable growers ie., (those who are supplying to corporate bodies and those who are supplying to traditional markets) and the requirements in their adjustments for optimum utilization of resources.

MATERIAL AND METHODS

The study has been carried out in two districts of Andhra Pradesh i.e., Rangareddy and Medak districts which have been operating their retail outlets to Hyderabad city. A sample size of 468 vegetable cultivators was selected of which 234 were from Rangareddy and 234 were from Medak district. Out of 234, 117 farmers were vegetable suppliers to supermarkets and 117 were vegetable suppliers to traditional markets. Out of 117 samples 39 each of tomato, brinjal and bhendi farmers were

selected duly including all the three category of farmers in each district.

Production Function Analysis: Cobb-Douglas production function

The Cobb-Douglas production function was specified in the following power form with six inputs.

$$Y=aX_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} X_6^{b6} \ldots\ldots\ldots e^u$$

Y = Yield in Qlts/hect.

X_1 = Human labour in man days/hect.

X_2 = Bullock labour in man days/hect.

X_3 = Seeds in Kg/hect.

X_4 = Nutrients in Kg/hect.

X_5 = FYM in tonns/hect.

X_6 = PPC in lit/hect.

a = Intercept.

μ = Stochastic disturbance term.

e = Napier base.

b_1 to b_6 = Partial elasticity coefficients of X_1 to X_6 inputs.

In order to know the goodness of fit the adjusted coefficient of multiple determination R^{-2} was calculated using the following formula.

$$R^{-2} = 1-(1-R^2) \text{ X } n-1 / n-k$$

R^{-2} = Unbiased coefficient of multiple determination.

n = Number of sample observations.

k = Number of parameters estimated from the sample including intercept.

Resource use efficiency

The ratio of the MVP to MFC was used to determine the resource use efficiency as shown in the following equation (Rahman and Lawal 2003).

$$r = MVP / MFC$$

Where,

r = Efficiency ratio

MVP = Marginal value product of variable input.

MFC = Marginal factor cost

$$MPPx_i = \frac{\overline{Y}}{\overline{X}} x\ b_i$$

$$MVP = MPPx_i \times P_y$$

Where,

$\overline{Y}$ = Geometric mean of output Y

$\overline{X}$ = Geometric mean of input X_i

b_i = Elasticity of X_i

P_y = Price of output

If r is < 1 resource is made excessively or over utilized hence decreasing the quantity use of that resource to increase the yield. If r is > 1 resource is underutilized or being underutilized hence increasing its rate of use will increase yield levels. If r = 1 shows the resource is efficiently used, hence the point of profit maximization.

RESULTS AND DISCUSSION

Resource productivity of selected vegetables of Supermarket and traditional market supply farmers in Rangareddy district

The production function analysis for supermarket supply tomato producing farmers of Rangareddy district were presented in Table 1 which indicated that the regression coefficients of seeds (0.40) and nutrients (0.33) has positive significant effect on yield hence by increasing these two resources the yield of tomato crop can be increased. Human labour (-0.20) was found to be negatively significant which indicated excessive use of labour and warrant sourcing on this input. The returns to scale were 1.30 which was greater than unity, which indicated increasing returns to scale in supermarket supply tomato farms. For tomato producing traditional farmers the regression coefficient for seeds (-0.11) was negatively significant which indicated over-utilization of seeds in production activity. The human labour (0.28), nutrients (0.27) have positive significant effect. Thus it was found that there is a scope to increase the use of these inputs to increase the yield levels of tomato. The returns to scale was found to be 0.94 which shows decreasing returns to scale.

In case of brinjal supermarket supply farmers the elasticity coefficients for variables of human labour, bullock labour, seeds, nutrients were statistically significant at 10 and 5 per cent level i.e., every ten per cent increase in human labour, bullock labour and seeds increased the yield to an extent of 0.24 per cent, 0.13 per cent, 0.51 per cent and 5 per cent increase in nutrients increased the yield to an extent of 0.26 per cent respectively. The returns to scale were 1.14 indicating increasing returns. For traditional market supply farmers bullock labour (0.04), nutrients (0.73), FYM (0.04) had positive influence, on the producer indicating that there was increase in yield for the increased use of any of the identified resources. Returns to scale were 0.80 which indicates decreasing returns.

The production function analysis in the case of supermarket supply bhendi farmers indicated that 78 per cent of the variation in the yield was explained by variables included in the production function. It was observed that coefficients for human labour at 1 per cent, nutrients at 5 per cent, PPC at 10 per

Table 1 . Production Function Estimates for Supermarket and Traditional Market Supply Farmers of Selected Vegetables in Rangareddy and Medak Districts

(per hectare)

Particulars	Super market supply farmers			Traditional market supply farmers		
	Tomato	Brinjal	Bhendi	Tomato	Brinjal	Bhendi
Rangareddy						
Intercept	10.93***	9.03***	5.38***	7.07***	4.94*	-5.67*
	(1.14)	(1.17)	(0.61)	(0.72)	(2.21)	(3.39)
Human labour	-0.20*	0.24*	0.41***	0.28***	-0.005	0.50*
(mandays/ha	(0.08)	(0.10)	(0.07)	(0.06)	(0.03)	(0.22)
Bullock	-0.01	0.13*	0.06	-0.004	0.04*	0.14*
labour(mandays/ha)	(0.01)	(0.07)	(0.05)	(0.006)	(0.01)	(0.08)
Seeds (g)	0.40*	0.51*	0.04	-0.11*	-0.05	-0.69*
	(0.18)	(0.24)	(0.07)	(0.05)	(0.48)	(0.29)
Nutrients (Kg)	0.33***	0.26**	0.24**	0.27*	0.73**	0.90**
	(0.09)	(0.08)	(0.04)	(0.13)	(0.25)	(0.31)
FYM (Kg)	-0.007	0.003	0.02	-0.002	0.04*	-0.002
	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.03)
PPC (Kg)	0.05	-0.001	0.03*	-0.01	0.05	-0.04
	(0.01)	(0.03)	(0.01)	(0.01)	(0.05)	(0.03)
R^{-2}	0.74	0.68	0.78	0.83	0.76	0.75
Returns to scale	1.30	1.14	0.82	0.94	0.80	0.81
Medak						
Intercept	6.57***	6.74***	-9.63	2.49	2.25*	-7.48
	(1.36)	(1.15)	(3.49)	(1.90)	(1.21)	(4.87)
Human labour	0.07	0.04	-0.26	-0.04	-0.43*	-0.12
(mandays	(0.14)	(0.03)	(0.18)	(0.53)	(0.18)	(0.13)
Bullock labour	0.04	0.01	-0.002	0.009	0.01	0.02
(mandays	(0.10)	(0.01)	(0.03)	(0.01)	(0.02)	(0.03)
Seeds (g)	0.06	0.76**	2.08***	-0.07	-0.006	-0.29
	(0.06)	(0.24)	(0.52)	(0.05)	(0.02)	(0.26)
Nutrients(Kg)	0.18	-0.42	0.40*	1.29***	1.58***	2.04**
	(0.18)	(0.15)	(0.18)	(0.19)	(0.26)	(0.61)
FYM(Kg)	0.11***	0.04*	-0.003	-0.002	-0.003	0.008
	(0.008)	(0.02)	(0.01)	(0.00)	(0.00)	(0.04)
PPC (Kg)	0.07	0.13***	0.07***	-0.03*	-0.07*	-0.08
	(0.04)	(0.02)	(0.02)	(1.01)	(0.03)	(0.06)
R^{-2}	0.71	0.85	0.85	0.65	0.77	0.80
Returns to scale	0.53	1.09	2.28	1.15	1.08	1.57

(figures in parenthesis are respective standard errors)

cent were positively significant. It can be interpreted here that for every 1 per cent increase in human labour, 5 per cent increase in nutrients, 10 per cent increase in PPC the total yield would increase to the tune of 0.41, 0.24, and 0.03 per cent respectively. This implies that well populated fields and use of nutrients have a greater chance for obtaining the higher yield per acre. The sum of elasticities of coefficient was found to be 0.82. Regarding traditional market supply bhendi producers the regression coefficients of human labour (0.50) and bullock labour (0.14) showed positive significant effect at 10 per cent level of probability. Seeds (-0.69) showed negative significant effect indicating their over usage. This clearly brings out the fact that there was over and indiscriminate use of seeds

Table 2 : The MVP To MFC Ratios from the Production Function Estimates of Supermarket and Traditional Market Supply Farmers.

(per hectare)

	Super market supply farmers			Traditional market supply farmers		
Particulars	Tomato	Brinjal	Bhendi	Tomato	Brinjal	Bhendi
Rangareddy						
Human labour	-0.79	1.00	1.39	0.79	-0.01	1.42
Bullock labour	-1.21	12.83	4.27	-0.38	3.68	8.11
Seeds	23.81	29.94	0.09	-5.47	-2.53	-1.27
Nutrients	4.78	2.74	1.77	2.67	5.74	6.38
FYM	-0.01	0.01	0.03	-0.002	0.11	-0.002
PPC	19.34	-0.32	7.44	-3.13	11.35	-8.07
Medak						
Human labour	0.26	0.14	-0.88	-0.13	-1.48	-0.36
Bullock labour	4.89	1.16	-0.14	1.02	1.002	1.33
Seeds	3.61	44.00	5.42	-3.32	-0.31	-0.58
Nutrients	3.08	-5.09	3.63	14.41	12.92	14.65
FYM	0.15	0.11	-0.005	-0.002	-0.01	0.02
PPC	13.93	47.87	20.60	-13.26	-19.38	-17.43

by traditional market supply farmers for all the three selected vegetables. The returns to scale were 0.81 which shows decreasing returns to scale. The traditional farmers were using inputs indiscriminately due to lack of standardized production technologies.

The marginal value product (MVP) of each explanatory variable was computed and compared with its marginal factor cost (MFC) to know the allocative efficiency of resources. The results of the estimated MVP and MFC values are presented in Table 2. As observed from the results in Rangareddy district, supermarket suppliing tomato farmers the MVP: MFC ratio for nutrients (4.78), PPC (19.34), seeds (23.81), were more than unity, which indicates the under-utilization of these resources. There is a scope for increasing the yield by increasing these resources to some extent, while for FYM (-0.01), human labour (-0.79), bullock labour (-1.21) in supermarket supply tomato farmers, and FYM (-0.002), PPC (-3.13), bullock labour (-0.38), seeds (-5.47) in traditional market supply farmers were negative implying uneconomic use of these resources. The ratio suggests curtailment of resources to some extent. In brinjal traditional market supply farmers human labour (-0.01), seeds (-2.53) were negative indicating uneconomic use of these resource hence some units of human labour, seeds can be withdrawn from the production process in order to increase the yield.

The regression coefficients of nutrients, PPC, bullock labour were more than one indicating that the resources were sub-optimally used by supermarket supply bhendi farmers and for traditional market supply farmers nutrients, bullock labour were underutilized. Human labour in both the cases showed optimal allocation of the resource.

Resource productivity of selected vegetables of Supermarket and traditional farmers in Medak district

The production function analysis for supermarket supply tomato farmers in Medak district shown in Table1 indicated that 71 per cent of the variation in yield was explained by the explanatory variables included in the production function. All the variables were positive and FYM (0.11) shows significant effect at 1 per cent level. In the case of traditional market supply tomato farms 65 per cent variation was explained by the explanatory variables. PPC (-0.03) shows negative significant effect at 10 per cent level of probability indicating that the farmers are were not homogenous with respect to their behavior in using resources optimally. The returns to scale for tomato supermarket supply farmer was 0.53 which is less than one showing decreasing returns to scale when compared to traditional market supply farmer with 1.15

The output of regression analysis for the supermarket supply brinjal producing farmers revealed that the seeds (0.76), FYM (0.04) and PPC (0.13) were positively significant indicating that there is scope to increase the yields by increasing the usage of these inputs to further extent. Returns to scale was 1.09. In case of brinjal producer of traditional market supply farmers the elasticity coefficients of human labour (-0.43), PPC (-0.07) showed negative significant effect which showed that yield would decrease, if level of these resources were further increased, keeping all other inputs constant. The returns to scale were 1.08, which indicated increasing returns.

Regarding bhendi production for supermarket supply farmers the coefficient of multiple determination R^2 was found to be 0.85. The regression coefficients for seeds and PPC shows positive significant effect indicating that for every one per cent increase in seeds and PPC the yield would increase by 2.08 per cent and 0.07 per cent respectively. In case of traditional market supply farmers R^2 was 0.80. The elasticity coefficient for nutrients showed positive significant effect at one per cent level of probability. The returns to scale for supermarket supply bhendi producing farmers was 2.28 which was higher than that of traditional market supply farmer of 1.57 which further reiterates usage of resources at higher efficient level in supermarket supply farmers compared to traditional market supply farmers.

In case of Medak district supermarket supply tomato farmers the MVP: MFC ratio for nutrients PPC, bullock labor, seeds were more than unity suggesting that there was still scope for increasing these resources to get higher yields. This high marginal value product of capital inputs among the farmers can also be attributed to the high production elasticity of this resource among them and the low level at which it is used. Therefore given the production elasticity, the high marginal productivities and low level of utilization of these inputs, production levels could be substantially increased by increasing the level at which they were used. In the case of traditional market supply tomato farmers increasing returns to scale was noticed. Dileep et al.,(2002) employed Cobb-Douglas production function to estimate the production function of tomato and found that the returns to scale was more than unity in non contract farmers. In traditional market supply brinjal farms FYM (-0.01), PPC (-19.38), human labour (-1.48), seeds (-0.31) were negative implying uneconomic use of these resources. The ratios suggests for curtailment of these resources to some extent by traditional farmers For supermarket supply bhendi farmers the MVP: MFC ratio for nutrients, PPC, seeds and for traditional market supply farms nutrients, bullock labour were positive and more than one indicating the scope to increase the use of these resources to augment the yield levels. It means that the yields from vegetable cultivation by traditional market supply farms were likely to increase if more of inputs such as nutrients, bullock labour were used. Using more labourer in such a labour intensive cultivation would enable increase of the returns from this crop.

CONCLUSIONS

The resource productivity of sample farmers by fitting Cobb-Douglas production function to the selected variables indicated that in Rangareddy district supermarket supplying farmers by increasing the use of seeds and nutrients , human labour, bullock labour , PPC one can increase the yield levels of the vegetables and over-utilization of seeds was noticed by traditional market supplying farmers.

In Rangareddy district returns to scale was highest for Supermarket supply farms of tomato and brinjal while in traditional market supplying farms decreasing returns was noticed by all the three vegetables. From the measure of return to scale obtained, traditional market supply farmers experienced decreasing return to scale for the factors of production employed. This implies that a one percentage increase in the use of these factors would have led to a less than one percent increases in the value of output. However, this is the rational level of production, farmers are not allocatively efficient yet as it is shown by the efficiency measures. Better utilization of resources is important and should be emphasized through increased use of capital intensive inputs such as fertilizers, seeds. Production of most of the high-value agricultural commodities is capital- and information/knowledge- intensive and riskier, while traditional farmers lack access to capital, improved technologies, quality inputs, extension services needed for entry into the high- value segment. It is therefore essential to strengthen institutional mechanisms that improves smallholders' access to credit, technology and support services.

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