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Technical Inefficiency in Rice Production in N. S. P Left Command Area in Nalgonda District

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ABSTRACT

Rice is one of the important cereal crops both in India as well as in Andhra pradesh. In Rice production variables like area, fertilizers, bullock labour and machine labour were positively significant, where the human labour is negatively significant.The socio Economic factors like size of the farm, age of the farmer, education of the farmer, experience in rice production and contacts with the extension agencies play important role in the technical inefficiency of rice production.

Key words : Rice production, Technical inefficiency

India is facing challenges to feed its growing population. It is estimated that about 260 million tonnes (MT) of food grains are to be produced annually by the year 2030 to meet the food requirements. Rice is one of the major food grain crops in India occupying 44.4 million ha with a production of 84.9 MT.India has witnessed major changes in the productivity of cereal crops after Green Revolution. The effect of the technological break through has been significant in almost all the states.However, many agricultural scientists and farm experts have endorsed the view that the performance of agriculture is yet to reach its potential level. Andhra Pradesh is one of major rice producing states in our country. Nalgonda is one of the major producing district in Telangana region. In Nalgonda NSP Left command area is predominant Rice producing area with an area of 70,972 ha. Inefficiency is the inability of the farmer to produce maximum possible output that can be produced by the resources available with him. Increasing the efficiency in production is one of the means through which output can be increased. It is a very important factor of productivity growth, especially in developing agricultural economies where resources are meagre and opportunities for developing and adapting better technologies are less. Under these circumstances reducing the extent of inefficiency can also help to decide whether to improve efficiency or to develop new technology to raise agricultural production.

MATERIAL AND METHODS

The present study was undertaken in the NSP Left Command area of Nalgonda district. A sample of 180 farmers comprising 124 small (<1 – 2 hectares), 43 medium (2- 4 hectares) and 13 large (4 – 10 hectares) farmers were selected from different locations of the canal command area through stratified random sampling method. Data pertaining to the agricultural year 2006-07 were collected through personal interview method.

Technical inefficiency of the individual farm size was estimated through stochastic frontier production function analysis. The specific stochastic frontier production function model estimated was

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + (V_i - U_i)$$

Where,

Y = Yield of rice in Kg.

β_0 ..... β_8 parameters to be estimated.

X_1 = Land in hectares.

X_2 = Seeds in Kg.

X_3 = Human labour in man-days.

X_4 = Machine labour in hours

X_5 = Fertilisers in Kg.

X_6 = plant protection chemicals in Rupees

X_7 = Manures in tonnes.

V_i = Random error having zero mean which is associated with random factor (e.g., measurement error in production,weather etc) which are not under control of the farmer

U_i = one –sided ineffiency component.

This type of stochastic frontier was independently proposed by Aigner *et al* (1977)and Meeusen and vanden Broeck (1977).

The random errors, V_i i=1,2…were assumed to be independently and identically distributed as N ($0\sigma_v^2$) random variable independent of U_i's which were assumed to be non-negative truncations of the (N ($0,\sigma_v^2$)distribution(i.e. half normal distribution).

Given the assumption of the above stochastic frontier model, inference about the parameters of the model can be based on the maximum likelihood estimation because the standard regularity condition hold. Aigner *et al* (1977) suggested that the maximum likehood estimates of the parameters of the model can be obtained in terms of the parameterisation $\sigma^2 + \sigma_v^2 = \sigma_s^2$ and $\gamma = \sigma / \sigma_v$. Rather than using the non-negative parameter γ of the parameterisation of Battesse and Corra (1992) who replaced σ_v^2 and σ_u^2 with $\sigma^2 = \sigma_u^2 + \sigma_v^2$ and $\gamma = \sigma_u^2 / \sigma_u^2 + \sigma_v^2$. The parameter γ must lie between 0 and 1. Technical inefficiency of an individual farm size is defined as

Technical inefficiency = 1- (exp($-U_i$)).

$$= 1 - (Q_i / Q_i^*)$$

Where Q_i^* is the maximum possible output

To study the effect of socio-economic factors in different farm size groups, correlation coefficients between inefficiency and socio-economic variables were worked out and tested for their significance using t-ratios. Various factors studied were farm size, age of the farmer, experience of the farmer, education of the farmer, contacts of the farmer with extension agencies and number of family members working on the farm.

RESULTS AND DISSCUSSION

The estimated coefficients of frontier production function are given in the Table 1. All independent variables considered have positive coefficients except human labour. Area, fertilizers, plant protection chemicals, bullock labour and machine labour were positively significant.

These positive and significant values indicate that there is scope for increasing production of rice by increasing the level of these inputs. Coefficient value of human labour was – 0.2045, which was significant at 5 per cent level. This gives an indication that farmers are using excess human labour in rice production. The sum of the estimated coefficients of independent variables ($\sum$ bi) was 1.0512. Gamma value was found to be 0.7223 indicating the presence as well as dominance of inefficiency effect over random error. This is in conformation with the studies of Kaliragan (1981) Sharma and Datta (1997) stated that the estimated co efficients of independent variables (Σbi) was 1.102 indicating the presence as well as dominance of inefficiency effect over random error.

From the Table 2 the technical inefficiency among the sample was ranged between 5.68 and 61.54 per cent with an average of 26.34 per cent. The analysis indicates the scope to increase physical production of rice by 26.34 per cent with judicious use of existing resources and technology. This is in conformation with the study of Thomas and Sundarsen (2000)

Role of Socio Economic Factors:

The effect of each factor on technical inefficiency is given in Table 3 and Table 4 presents the results of correlation analysis.

Farm Size:

The technical inefficiency in rice production decreased with increase in farm size. The average technical inefficiency was higher in small farms (25.85 per cent), followed by medium farms (22.14) and large farms (15.67). Analysis of variance revealed that the difference in technical inefficiency among various size-groups was significant at one per cent level. Negative correlation coefficient between farm size and technical inefficiency also indicates that as farm size increases inefficiency will reduce. This result clearly indicates that bigger farm size provides opportunity for better utilization of inputs and machinery making them more efficient. In the study area small and medium farmers are predominant so there is no scope to increase farm size as such, co- operative type of farming, where farmers bring their resources together including land, be encouraged to increase the farm size.

Age of the farmer:

To study the effect of age, the farmers were grouped into four categories, i.e., below 40 years, 40-50 years, 50-60 years and above 60 years and their average technical inefficiency was compared. The farmers belonging to age 40-50 years showed lowest technical inefficiency in the production of rice followed by the farmers belonging below 40 years age group. Technical inefficiency of the farmers belonging to 50-60 years age group and above 60 years age group was comparatively higher than that of younger age groups. Analysis of variance revealed that the technical inefficiency was significant.

The age of the farmer was positively and

Table 1. Coefficients of Stochastic Frontier Production for Rice

Variable	Coefficient	Standard error
Intercept	7.2168	0.7529
Area	0.9547 **	0.1578
Seed	0.1352	0.1463
Fertilisers	0.0249 **	0.0056
Plant protection Chemicals	0.0109**	0.0035
Human labour	-0.2045	0.1009
Bullock labour	0.0565*	0.0198
Machine labour	0.0169**	0.0045
Manures	0.0566	0.0635
Ebi	1.0512	
Gamma	0.7223	0.0639
Log-likehood function	-55.5472	

** and * Significant at 1 and 5 percent level, respectively.

Table 2. Technical inefficiency in Rice production

Technical inefficiency	Percentage
Maximum	61.54
Minimum	5.68
Average	26.34
Total sample	180

significantly correlated with technical inefficiency indicating that as age of the farmer increases he will become more inefficient. As the age increases farmers become more risk averters and hesitate to adopt new technologies making the product on process less efficient. If we see both the results together, it will be clear that after certain age inefficiency will increase with increase in age.

Education of the farmer:

Technical inefficiency reduced significantly with the increase in the level of education. Correlation coefficient between education and technical inefficiency was also negative and significant. Lowest technical inefficiency in rice production was found with the college educated farmers (20.15) followed by secondary educated farmers (23.32). Technical inefficiency of illiterate and primary educated farmers as 28.29 and 30.15 per cent respectively, which was comparatively high.The well- educated farmers can understand production technology better. Moreover they can get information from various sources and can maintain relationship with extension agencies giving an edge over the illiterate farmer. Hence they can reduce the inefficiency to a great extent.

Experience in Rice production

Farmers based on their experience in production of rice, were classified into three groups viz, below 5- 10 years, 10- 15 years and above 15 years.The farmers having 5- 10 years experience recorded lowest technical inefficiency (22.48 per cent) in rice production, followed by the farmers with experience less than 5 years (23.28 per cent).The farmers with experience of above 15 years recorded the highest technical inefficiency (29.65). Analysis of variance revealed that these differences were statistically significant. This variable was positively correlated with inefficiency that was statistically insignificant. Though the relationship was insignificant it indicates that as experience increases inefficiency will also increase, which sounds illogical. This may be due to the effect of experience as these two variables are highly correlated. To eliminate the effect of age, partial correlation coefficient was calculated, which was – 0.1369 and significant at 5 per cent level. This clearly indicates that experience is negatively correlated with inefficiency and as experience increases inefficiency in rice production will reduce.

Extension Contacts:

To know the influence of extension contacts, inefficiency of the farmers who have contacts with extension agencies was compared with those who do not have contacts with extension agencies. Technical inefficiency in rice production was significantly low (20.26) with the farmers who have contacts with extension agencies. Contacts of the

Table 3: Influence of Socio Economic Factors on Technical Inefficiency

Particulars	Technical inefficiency
1. Farm size	
Small	26.54
Medium	21.19
Large	17.12
F value	5.5145**
2. Age	
< 40 years	20.82
40 –50 years	18.78
50-60 years	26.34
>60 years	31.35
F value	6.6123**
3. Experience	
< 5years	23.28
5-10 years	22.48
10-15 years	26.32
> 5 years	29.65
F value	3.9245**
4. Education	
Illiterate	28.29
Primary	30.15
Secondary	23.32
College	20.15
F value	2.6539*
5. Extension contacts	
Farms without extension contacts	27.18
Farms with extension contacts	20.26
F value	10.638**
6. Caste	
Lower	24.26
Higher	25.00
F value	1.5182

** and * Significant at 1 and 5 per cent level, respectively.

farmers with extension agencies was also found to be negatively correlated with inefficiency in rice production indicating that farmers having contacts with extension agencies were more efficient than those who do not have contacts. The farmers who had contacts with extension workers agencies will get the right suggestions at the right time making themselves more efficient. This analysis highlights the role of extension services in improving the efficiency of the farmers and in increasing the productivity and production of crop.

Caste of the farmer:

Farmer based on the social order of their caste were grouped into lower (SC & ST) and higher (BC & OC) groups and their average inefficiency was compared. Analysis of variance revealed that there was no significant difference between inefficiency levels of lower and higher caste farmers in the production of rice. But higher caste farmers registered slightly lower technical inefficiency when compared with lower cast farmers in rice production. The correlation coefficient was negative but not significant indicating that inefficient farmers are distributed in both higher as well as lower castes.

Conclusion:

The study reveals the existence of technical inefficiency in the production of rice in the study area. Yield of rice can be considerably

Table 4: Correlation of Socio Economic Factors with Inefficiency in Rice Production

Variable	Correlation coefficient	T-ratio
Farm size	-0.1756**	-2.9201
Age	0.2038**	3.3687
Experience	0.0794	1.2473
	(-0.1367)	(-2.2618*)
Education	-0.1294**	-2.0261
Extension contacts	-0.1805**	-3.0197
Caste	-0.0841	-1.0078

Note : ** and * Significant at 1 and 5 per cent level, respectively.
Figures in parentheses are values of partial correlation.

improved without increasing the level of inputs in the study area if the inefficiency is reduced. Technical inefficiency in production of rice is negatively related with farm size, education of the farmer, experience and extension contacts and positively related with age. Caste of the farmer in the canal command area does not have any influence on inefficiency. The measures like encouraging co-operative type of farming, land consolidation, improving literacy rate, strengthening extension services and providing alternative employment opportunities should be taken up in this area to reduce the inefficiency in rice production.

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