AARJSH VOLUME 1 ISSUE 21 (MARCH 2014) ISSN : 2278 – 859X

AARA

A Peer Reviewed International Journal of Asian Academic Research Associates

AARJSH

ASIAN ACADEMIC RESEARCH JOURNAL OF SOCIAL SCIENCE & HUMANITIES

FARMERS' SCHOOLING AND FARM EFFICIENCY IN PADDY PRODUCTION: A STOCHASTIC FRONTIER FUNCTION APPROACH

DR. RANGALAL MOHAPATRA*

*Assistant Professor,Deptt. Economics,Sikkim University(Central University)

Abstract

In the context of technologically progressing agrarian environment, the complementarities of human capital in production is empirically investigated in the form of the effect of farm household's education, family education and experience in achieving profit efficiency among the 200 paddy farm households of Odisha, India. The results suggest that 92% of the differences in the efficiency scores are due to profit inefficiency. The mean profit efficiency is 87.11% suggesting that an estimated 12.89% of the profit is lost due to a combination of both technical and allocative inefficiency. Introduction of farm-oriented education and extension services to the farm people will be more effective

Keywords: Profit efficiency, Effective head of the household, Frontier profit function, Education dummy.

JEL Classification: Q120, O13

1- Introduction

Odisha, a state of India is an agrarian state with agriculture and animal husbandry sector contributing more than 21.11% of the Net State Domestic Product and providing employment direct or indirect to 70% of the population as per 2001 census. Gross State Domestic product from agriculture during 2007-2008 at constant prices 1999-2000 is 19.51%. Since, 34% of the cultivated area is irrigated, crop production in the state much depends on the occurrence of the favorable monsoon. Increase in population leading to the increasing demand for food grain requires the food production to increase. In one hand, demand for food grain goes on increasing due to growing population, on the other hand, growing industrialization and urbanization, fragmentation of land holding has lead to the rapid decline in the area under cultivation. Hence, increase in food grain production is an urgent requirement for the state to meet the future growing demand. In this context, the role of Human Capital- Skills and Knowledge- of the farm household in improving the efficiency and productivity in farm production is of paramount importance. Various forms of human capital such as formal schooling, experience, extension services and innovation etc., have high complementary effect with the access to new information; decoding the relevant information; the use of new inputs; adoption of new methods of production and thereby reaping maximum profit out of it. In Transforming Traditional Agriculture, T. W. Schultz (1964) made it clear that to improve the lot of the poor people in low income developing countries are not space energy and cropland; the determining factor is improvement in the Human quality.

This paper focused on empirical analysis of the joint estimation of the stochastic frontier profit function and the factors of inefficiency leading to less profit of 200 High Yielding Variety (HYV) paddy farm households of the study area (Goleipur Panchayat) of the Korei Block, Jajpur, Odisha. The Battese and Coelli extended model (1995) is used to find out the individual profit efficiency score and the lower profit efficiency score is reflected in terms of both technical and allocative inefficiency. This paper is based on the following justifications. First, Even though many empirical investigations on education and farm production efficiency have been conducted with the help of panel data and secondary data on India level, to the author's knowledge, no such similar studies with respect to the effect of education on efficiency in farm production (paddy) using Primary data in the state of Odisha have been made.(Battese and Coelli, 1992; Kalirajan, 1981,1991). Second the frontier function approach provides farm specific efficiency measures and the linear factors of inefficiency (Aigner, Lovel Schemidt, 1977; Meeusen and Van den Broeck, 1977). Third, since stochastic production function may not be appropriate (Yotopolous *et. al.*, 1973), when farmers face different prices and have different endowments, application of stochastic profit function model is more appropriate (Ali and Flinn, 1989;Kumbhakar and Bhattacharya, 1992; Ali *et. al.*,1994; Wang *et. al.*, 1996). Lastly, the study uses the education of the effective head as a main variable as well as dummy variable to know the impact of education at different levels of schooling.

Owing to the cost- push and food inflation, the costs of agricultural input prices have been rising at a higher rate. On the other hand food grain prices are increasing due to supply demand gap. Hence, achieving profit efficiency comparative to productive efficiency seems to be more important. Henceforth, the following hypotheses are framed to examine the role of education family education, education dummy on profit efficiency

2-Materials and Methods

2.1-Education in Production

The productive value of education has its root in two distinct phenomena such as worker effect and allocative effect. Increased education simply may permit a worker to accomplish more with resources at hand. This '***Worker effect***' is the marginal product of education as it is normally defined, that is the increased output per unit change in education holding other factor quantities constant. On the other hand, increased education may enhance the worker's ability to acquire and decode information and cost and productive characteristics of other inputs. As such a change in education results in a change in other inputs including perhaps the use of some new factors that otherwise would not have used. This is called allocative effect. In a pioneering study exploring the economic effects of education, Z. Grilliches (1964) used production function analysis to highlight the contribution of education in agricultural productivity. However, following Welch (1970), the subsequent literature has not deemed it necessary to maintain the distinction between the innovative and allocative effect.

Prof. Choudhuri (1968) has made the first clear-cut distinction between worker and allocative effect. The evidence from past literature surveyed indicates that production function with Cobb-Douglas form has been used frequently. Engineering, Gross sales and value Added production function have been used to study the impact of technical and allocative efficiency part of education on farm production (Pudasaini, 1983). Since the engineering production function misses much of the education on production[1]. Some studies are based on the technical efficiency part of education between two groups of farmers (Welch, 1970; Azhar, 1991) where as, some other researchers have focused on the allocative efficiency part of education (Huffman, 1977; Ram, 1980). The studies used to analyze both technical and allocative efficiency are (Welch, 1970; Mohapatra, 1998). Evidence from 13 low-income countries shows that farm productivity, on an average, increases by 8.7 percent as a result of a farm completing four years of elementary education (Lockheed et. al, 1980). Bikhauser ***et. al,*** (1991) reviewed Forty-seven studies from 17 countries and found that 33 studies show significant and positive extension effect. A major breakthrough in the methodology occurred after the pioneering work of Farrell (1957) on the measurement of efficiency and the introduction of stochastic frontier models, independently proposed by Aigner, Lovell and Schmidt (1977) and Meeusen and Vanden Broeck (1977) and extended by Jondrow et.al., (1982) . A large number of empirical studies have been conducted on studying the technical and allocative and economic efficiency of the farms with special reference to education age and experience of the farms using cross sectional data (Kalirajan 1981, 1991; Sqires and Tabor 1991; Bravo-Ureta and Pinheiro, 1997; Ajibefun et.al., 2002; Ogundari et.al., 2006;) . The estimation of the parameters of these models can be accomplished by Maximum Likelihood Method which is more efficient (Green, 1980). Bravo-Ureta and Pinheiro (1993) reviewed seven deterministic frontier in which, five uses C-D functional form and out 24 stochastic frontier 17 uses C-D form and the rest uses Translog functional form. More recent studies with respect to the application of stochastic frontier method are (Karafillis et.al., 2009; Nganga et.al., 2010 ;Abu et. al.,2011)

---

[1] Welch (1970) has shown that the engineering production function measures only the worker effect and neglects the allocative effect and input selection effect.

2.2-Type, Nature and Source of Data

For the purpose of the empirical testing of the paddy profit efficiency of the effective farm households with respect to their levels of schooling, experience, family education, primary data of the 200 farm households have been collected. The Primary data have been collected from the **Goleipur** Panchayat of **Korei** block, Jajpur district, Odisha. The specific area of the study is chosen for four reasons: (1) all the villages of the study area as well as of the Panchayat are located either side of the National Highway No.-5 that extends from **Kolkata to Chennai**, (2) The soil is comparatively more fertile as the river The **Kharashrota,** the tributary of The Brahmani, passes through this area, (3) the entire Panchayat is well connected to the major commercial places such as Jajpur Town, Panikoili, the district head quarter ; Jajpur Keonjhar Road, the steel city of Orissa and Chandikhol that connects to the Paradeep sea port. Because of the well road connectivity to different market places, the farmers get the advantage of the growing demand for the agricultural product in the market.

To collect information on the farm production system, a formal permission was taken from the Sarapancha of the Village Panchayat. Six villages have been selected for collecting information from 200 farm households. Since the villages are very much close to each other, there are no observed differences in the geographical features, cultural practices as well as the farm practices of the people. Whatever technological advancement and new information regarding the modern farm practices are available; it has equal access to all the farm households in the study area.

A questionnaire, both in Odiya and English language, has been made in order to make the people convenient in understanding the content of the question and the purpose of the question and to answer the question in an appropriate manner. The entire questionnaire consists of fourteen main questions. The first question is about the name and address of the cultivator. The first question gives the detail information about the whereabouts of the farm household. The other questions covers the details of the status of the family members- married, unmarried, number of males and females, age of the family members, occupation of the members etc., education status of the family, number of years of formal schooling completed, area of agricultural holdings, gross cropped area, and net shown area, expenditure on the attached farm servants, wages paid, rent paid and received by the farm household in hiring in or out the labor and land, crop-wise area under cultivation, total volume of production of each crop, yield rate on different fragments of holding, stock of capital equipments and drought animals; crop-wise input requirement on different fragments of holdings; particulars of the livestock; expenses on the drought animals for fodder maintenance; running and maintenance on farm machinery. The six villages have been purposively selected for the purpose of collection of primary data for the study. The farm [2]households producing High Yielding Variety (HYV) Paddy are randomly chosen irrespective of the caste, class creed and religion, farm size and economic status.

3-Empirical Model Specification:

The profit function approach combines the concepts of technical and allocative efficiency in the profit relationship and any lower profits or revenue for the producer is reflected in the form of decision-making errors. Profit efficiency, therefore, is defined as the ability of a farm to achieve highest possible profit given the prices and levels of fixed factors of that farm and profit inefficiency is defined as the loss of profit for not operating on the frontier (Ali and Byrelee, 1991). Battese and Coelli (1995) extended the stochastic production frontier model by suggesting that the inefficiency effects can be expressed as a linear function of explanatory variables reflecting farm specific characteristics. The advantage of this model is that it allows the estimation of farm specific efficiency scores and the factors explaining the efficiency differentials among farmers in single stage estimation. Following Rahaman (2002), this section utilizes the Battese and Coelli (1995) model by postulating a profit function, which is assumed to behave in a manner consistent with the stochastic frontier concept.

Profit efficiency in this study is defined as profit gain from operating on the profit frontier, taking into consideration farm specific prices and factors of production. Considering a farm maximizes profit subject to perfectly competitive input and output markets and a singular output technology that is quasi-concave in the **(n x 1)** vector of variable inputs and the **(m x 1)** vector of fixed inputs, Z.

[2] The Paddy is popularly known as SWARNA. This can be cultivated both in Kharif and Rabi season.

The actual normalized profit function, which, assumed to be well behaved could be derived as follows:

Farm profit is measured in terms of Gross margin (GM), which equals the difference between the Total revenue (TR) and the total variable cost (TVC). That is:

$$\mathbf{GM\ (\pi) = \Sigma(\ TR - TVC\ ) = \Sigma(\ PQ - WX_i\ )}$$

To normalize the profit function, Gross margin π .is divided in both side of the equation above by the price of the output (P). That is

$$[\pi\ (P, Z)/P\ ] = [\ \Sigma(\ PQ - WX_i)/P\ ] = Q - [(\ WX_i)/P] = f(\ X_i, Z\ ) - \Sigma\, p_i X_i$$

Where, TR represents total revenue, TVC represents total variable cost, P represents price of output (Q), X represents the quantity of optimized inputs used, Z represents the quantity of fixed inputs used, $p_i = W/P$ which represents normalized price of inputs X_i while $f(\ X_i, Z\ )$ represents production function.

The Cobb-Douglas profit function in implicit form, which specifies the production efficiency of the farmers, is expressed as follows:

$$\pi_i = (p_i, Z)\ \exp\ (\ V_i - U_i\ ),\ i = 1, 2, \ldots\ldots, 200$$

Where, π_i p_i, Z as defined above. The V_i s are assumed to be independent and identically distributed random errors, having normal $\mathbf{N\ (\ 0, \sigma_v^2)}$ distribution, independent of the U_i s. The U_i s are profit inefficiency effects, which are assumed to be non-negative truncation of half-normal distribution $\mathbf{N\ (\ \mu, \sigma_u^2)}$. The profit efficiency is expressed as the ratio of predicted actual profit to the predicted maximum profit for a best-practiced- farmer and this is represented as follows:

Profit efficiency

$$[(E\pi)\ /\ (\pi^{\ max}\ )\ ] = \pi = [\exp\{\pi(\ p, Z\ )\}\ \exp(\ \ln V\ )\ \exp(\ \ln - U\ ) - \theta]\ /\ [\exp\{\pi(\ p, Z\ )\}\exp(\ \ln V\ ) - \theta]$$

The farm specific profit efficiency is again the mean of the conditional distribution of U_i given by the E_Π and is defined as:

$$E_\Pi = E[\exp\ \{(-U_i)\ /\ (E_i)\}] \qquad (1)$$

E_{Π} takes the value between 0 and 1. If $U_i = 0$, i.e. on the frontier, obtaining potential maximum profit given the price it faces and the level of fixed factors. If $U_i > 0$, the farm is inefficient and he losses profit, as a result of inefficiency.

However, for this study, Coelli (1996) model is used to specify the stochastic frontier function with behavior inefficiency components and to estimate all parameters together in one-step maximum likelihood estimation. The explicit Cobb-Douglas functional form for crops- HYV paddy - growing farmers in the study area is therefore specified as follows:

$$\mathbf{Ln\ \pi_p = ln\ \beta_0 + \beta_1 ln\ Z_{1i} + \beta_2 ln\ P_{1i} + \beta_3 ln\ P_{2i} +}$$
$$\mathbf{\beta_4 ln\ P_{3i} + \beta_5 ln\ P_{4i} + \beta_6 ln\ P_{5i} + \beta_7 ln\ P_{6i} + (V_i - U_i)} \qquad \mathbf{(1.1)}$$

Where, Π_p, represent normalized profit for the paddy. Z_1 represents the acres of land under the HYV-paddy crops; P_1 represents the average wage per labor; P_2 average price for the pair of bullock labor employed; P_3 average price of manures per quintal; P_4 average price of fertilizer per Kg; P_5, the price of pesticides per 10 grams and P_6 the average price for the tractor for one hour in equation 1.1

The profit inefficiency model (U_i) is defined by:

$$\mathbf{U_i = \delta_0 + \delta_1\ EF + \delta_2\ EXP + \delta_3\ EEH + D_1 + D_2 + D_3} \qquad \mathbf{(1.2)}$$

Where EF, EXP EEH represent the average family education of the farm household, Experience of the effective farm and average education of the effective farm household for the crop under consideration. These socio economic variables are included to estimate the possible influence on the profit efficiencies of the HYV Paddy farmers in the study area.

The variance of the random errors, σ_v^2 and that of the profit inefficiency σ_u^2 and the over all variance σ^2 are related thus: $\sigma^2 = \sigma_v^2 + \sigma_u^2$, measure of total variation of profit from the frontier which can be attributed to profit inefficiency (Battesse and Corra, 1977). Battesse and Coelli (1995) provided log likelihood function after replacing σ_v^2 and σ_u^2 with $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and thus estimating gamma (γ) as: $\sigma_u^2 / (\sigma_v^2 + \sigma_u^2)$. The parameter ($\gamma$) represents the share of the inefficiency in the overall residual variance with the values in interval of 0 and 1. A value of one suggests the existence of a deterministic frontier; where as, a value of 0 can be seen as evidence in favor of OLS estimation.

The estimates of all the parameters of equation **1.1** and **1.2** are jointly estimated using the program **FRONTIER VERSION 4.1c** (Coelli, 1996). A three-step estimation method is used in obtaining the final maximum likelihood estimation. The likelihood maximization procedure uses Davidson Fletcher Powel Quassi- Newton algorithm. There is a debate about whether one should consider education as an input that enhances the allocative efficiency of a producer (Huffman, 1977; Schultz, 1971) or as a human capital that enhances technical efficiency (Yotopoulos and Nugent, 1976). Since the study uses education as a linear factor for explaining profit inefficiency, the following hypotheses are framed to study the impact of education on profit efficiency.

- Ho: Total volume of profit earned does not differ significantly with the variation in the educational level of the effective head of the farm household.

- Ha: Total volume of profit earned varies significantly with the variation in the educational level of the effective farm household.

- Ho: The profit efficiency of the effective head of the farm households does not vary with the differences in the average education of the family of the farm household and experience of the effective head.

- Ha: The profit efficiency of the effective head of the farm households does vary with the differences in the average education of the family of the farm household and experience of the effective head.

For equation (1.1) the profit function without inefficiency components were tested against the profit function with the inefficiency components as specified in the equation 1.2. The null hypothesis that there is no difference between these two models is rejected on the basis of the log likely hood ratio test (presented in the table below). The two models are compared for the presence of profit inefficiency effects using generalized likelihood ratio test, which is defined by the test statistic Chi-Square (χ^2), which is defined as:

$(\chi^2) = -2ln\{H_0/H_a\}$ Where the $((\chi^2))$ has a mixed chi-square distribution with the degree of freedom equal to the number of parameters excluded in the unrestricted model.

4- Results and Discussion

The summary statistics of the variables and the maximum likelihood estimates of the parameters of the Cobb-Douglas frontier profit function as defined in the equation **1.1** are presented in the Table **1.1A** and **1.1B.** The average gross margin of the HYV paddy production for the farm household is ₹ 6358.7 with a maximum of ₹ 21832.8. The area under the crop is in acres of Land (1 acre = 100 dcml.). The mean area under the crop for the farm household is 4. 1 acre. It means the farmers, on an average, are either marginal or small. The variation in the gross margin may be due to the variation in the area under the crop, of course, other factors are there. The average labor price per day (8 hours) is ₹35 with minimum of ₹ 32 and maximum of ₹ 40. The variation is due to the sudden rise in the demand for the labor power especially during the plantation and harvesting time. The farmer generally offers more wage to get the labor in time so that the farming work can be completed quickly. The bullock price is for the pair of bullocks for a day (8 hours). The fertilizer price is for Nitrogen since it is the most frequently used one by the farm households of the sample. The average education of the family and the effective head are the number of formal schooling years completed. Experience is the number of years a farmer has fully engaged in the farming activity.

The **Table-1.1b** presents the estimates of the unknown parameters of the frontier profit function for paddy along with the coefficients of the inefficiency components of the profit function.

The negative and statistical significant intercept shows the fact that the paddy farmers incurs negative profit margin if the production is at zero level. In fact the farmers in the study area incur some expenses on the maintenance of farm equipments, farm land and bullock power, even if production does not commence. Of course these are not fixed cost because these do not occur every time in the same quantity.

Table1.1A: Summary Statistics of the variables of the Stochastic Frontier Paddy profit Function

Variables	Minimum	Maximum	Mean	S.D
Gross Margin (₹)	180.5	21832.8	6358.7	4529.86
Area Under Crop (in acres)	2	8	4.10	1.2617
Average Labor Price Per day (₹)	32	40	35	10.5
Average Bullock price per day (₹)	65	75	70	15.25
Average Manures Price Per quintal (₹)	2	5	4	3.2
Average fertilizer price per Kg (₹)	5	6	5	2.12
Average Pesticide price per 10 Grams (₹)	4	5	3	1.6
Average Tractor Hour price(₹)	130	170	150	40.34
Average Education of tl Family(years of schooling completed)	2.514	8.270	10	4
Average Education of tl effective head(years of schooling completed)	2.35	8.13	13	3
Farm Experience(years	2.184	9.8	12	2

The coefficient of land under the crop is positive and statistically significant. It implies that gross margin increases by 22 per cent if the size of land increases by one acre. The coefficients of labor price, bullock labor price, fertilizer price and tractor hour price have shown the negative and statistically significant sign as it is expected theoretically. However, the coefficients of the pesticide price and manures price do not have significant impact in reducing gross margin of the farm household in paddy production. Both bullock price and the tractor hour price is statistically significant. The farm households use more tractor hours in order to do the reduce the ploughing time making the farm household more efficient in reducing the cost and time. On the other hand the farmers prefer to use bullock driven ploughing for certain work Hence, both bullock labor and tractors are essential even though the tractors are substituted for bullock labor. As far as the inefficiency components are concerned, the average education of the effective farm households and education of the family education have positive impact in improving profit efficiency of the paddy-growing farmers. The family role comes into the picture when the products are being marketed. The family with higher education tries to sell the product at the price fixed by the government. The middlemen play a negligible role in exploiting the farm household. Some farmers also shared the views that, selling the product at official rate is very troublesome[3]. Hence, they prefer to sell the product at the local market at a price much lower than the government declared rate. However, the experience of the effective farm household has no significant effect in reducing profit inefficiency. However the experience of the effective farm household has not significantly contributing in reducing profit inefficiency. The reason is that the experienced farm households improve productive efficiency but if something has to do with the external factors like market, price etc they fail to certain extent. When the education of the effective head is used as a dummy variable, then the college education and high school education significantly reduces profit inefficiency. The negative and statistically significant sign for the inefficiency coefficients indicate that higher is the level of

Table-1.1B: Maximum Likelihood Estimation of the Paddy Frontier Profit Function

Variable	Beta Coefficient	Value Coefficient	't' – Value
Constant	β_0	-0.824	8.136**
Land Area	β_1	0.226	11.05**

[3] The farmer has to open an account in the bank, if he does not have. Secondly, he has to arrange many documents that are essential for account opening. Thirdly, money is given only after a few days. The most interesting fact is that some officials charge some money in the name of bad quality of product.

Labor Price	β_2	-0.2168	2.42*
Bullock Price	β_3	-0.0761	2.030*
Manure Price	β_4	-0.318	0.3234
Fertilizer Price	β_5	-0.3793	3.875**
Pesticide Price	β_6	-0.5087	0. 5137
Tractor Price	β_7	-0.5467	2.068*
Inefficiency Constant	δ_0	0.554	9.475**
EF	δ_1	-0.007	3.652**
EXP	δ_2	-0.0176	1.314
EEH	δ_3	-0.1177	2.749*
College Education	D_1	-0.3534	6.12**
High school Education	D_2	-0.0428	2.31*
Primary Education	D_3	-0.479	0.9488
Sigma Square	σ^2	0.386	4.4665**
Gamma	Γ	0.922	48.33**
LLF		166.48	

***, ** indicates level of significance at 5% and 1%**

education, lower is the profit inefficiency. Hence, the null hypothesis that there are no differences in the profit efficiency due to differences in levels of education is rejected. The findings are consistent with the review of Lockheed *et.al* (1980), Duraiswamy (1994), Abdulail and Huffman (1988), Ali and Flinn (1989). The profit frontier for the paddy function without inefficiency component was estimated and the Log Likelihood function (LLF) value 102.8, where as the LLF value for the profit frontier in case of efficiency components is 166.48. Hence, the null hypothesis that there are no significant differences between these two models is rejected and, therefore the estimates of inefficiency error component model are presented in the table- 1.1B. As far as the gamma value is concerned, it can be concluded that it is statistically significant that 92 percent differences in the profit efficiency among the farm households in the study area are due to profit inefficiency. The composed error due to random shock and inefficiency is 0.368. The error due to inefficiency is 0.339

and the random error is 0.028. The Table**1.1C** shows the frequency distribution of the profit efficiency distribution of the paddy farmers in the study area. The mean profit efficiency among the farmers is 87 percent. Fifty Two per cent of the total paddy farmers are achieving 90 to 99 percent efficiency and 25 percent are in between 80 and 89 per cent. Only 10 per cent of the total paddy farmers have profit efficiency below 70 per cent. It means that on an average there is prospect of 25 percent improvement in profit efficiency in the HYV paddy production.

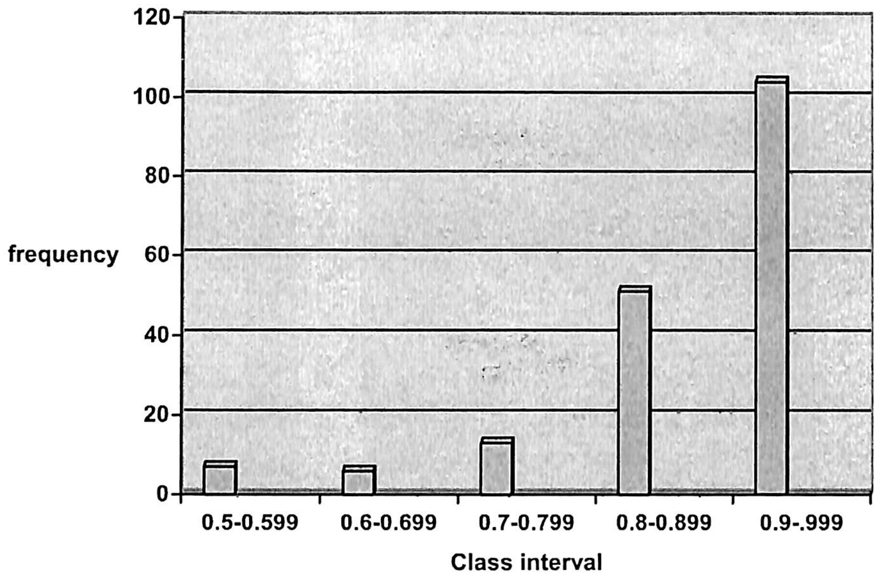
Table-1.1C

Frequency distribution of profit efficiency of HYV-paddy farm-households

Profit Efficiency Class interval	Frequency	Percentage of Total Farm households
0.5- 0.599	7	3.5
0.6- 0.699	6	6
0.7- 0.799	13	13
0.8- 0.899	51	25.5
0.9- 0.999	104	52
Average	87.11	Total = 100

The histogram for the frequency distribution of profit efficiency for the paddy farmers is presented in the **Figure1.1D**

Fig:1.1D-Histogram for profit efficiency of Paddy farmers



5-Summary and Conclusion:

This paper utilizes the method of the Cobb-Douglas profit frontier technology with composite error term to examine the HYV paddy farm specific efficiency level and the impact of the non-economic variables such as education of the effective heads, education of the family of the effective head, experience of the effective head and the educational dummy (D1, D2 and D3). The outcome the analysis is the primary inputs such as land Price of labour; fertilizer and tractor hour are important and statistically significant to the farmers in achieving higher profits. Out of the 200 farm households, 77.5 percent are very close to the profit frontier. The profit efficiency is improved with the levels of schooling of the effective head of the household especially college education and high school education, and education of the family. However, it is quite natural that the farmers having less years of education faces difficulty in gathering information about the modern technology, decoding the information, analysis and diffusion of the available information into the farm practice. When, other farms adopt a new and better technology with good return, the other farmers follow it blindly without understanding it. For example, some farmers use fertilizer in the faith that it will increase the productivity without the knowledge of the consequences of indiscriminate use of fertilizer. Most often, the farmers use both fertilizer and pesticides in the wrong time leading to the reduction in the production. Ever since, Chaudhuri has rearticulated this idea as "lapses back into Illiteracy". According to Nelson-Phelps **(1966)** hypothesis, the effect of education is supposed to differ over time, as the time passes and new technological diffusions are made in the field of agriculture, the knowledge either from primary schooling or from higher primary schooling is totally outdated to grasp and implement that into practice.

In the light of the above results, it can be suggested that the course curriculum at high school level in Odisha has no link to the agrarian issues, production pattern, use of agricultural technology, government initiative for agricultural development, sources of financial help. Hence a serious effort in reorienting the course curriculum towards, agrarian culture can highly improve the ability of the young generation to contribute to the agricultural production. Secondly, as the findings indicate that family education contributes to the improvement of profit efficiency, village level, panchayat level extension service centers and regular farming exhibitions should be organized by the government or NGO level so that involvement of the family in accessing the latest information in farm production will enhance. As far as the farm inputs are concerned, the government should ensure sufficient supply of fertilizer at right time with reasonable prices. The government should invest more on the production of tractors and other farm equipments and adequate training and skills should be provided to the farm people so that the cost of input use can be minimized. The most important issue is that, the government should make separate legislation for the fixation of wages for laborers engaged in food grain production so that the impact of formal sector wage will not occur. Much emphasis should be given on the introduction of farming related courses in the course curriculum of high school and college level education so that the students will be practically adapted to the agricultural practice. National level Agricultural schools for agricultural farming (A-schools), like Business schools (B-schools), should be set up with both private and public initiatives to have real change in the field of agriculture. The government must encourage the farming tour of the farmers to different places within or outside the country for learning better farming practice.

6- References:

Abu. Orefi, D. J Asember (2011). Opportunities for Small-Holder Spinach Farmers in Nigeria: A Profit Efficiency Analysis. Journal of Economics, 2(2): 75-79.

Abdulail, A and W.E. Huffman (1988). An Examination of Profit Inefficiency of Rice Farmers in Northern Ghana .Working Paper in Dept. of Economics, Iowa State University, Ames, U.S.A.

Aigner, D. J. Lovell, C. A. K and P. J. Schmidt (1977). Formulation and Estimation of Stochastic Frontier Production Model. Journal of Econometrics, 6:21-37.

Ajibefun, I. A., G. E. Battesse and R. Kada (2002). Technical Efficiency, Technological Change and Productivity of Hired and Family Labor in the Japanese Rice Industry. Empirical Economics Letters 1(1): 21-31.

Ali M., Flinn, J. C (1989). Profit Efficiency among Basmati Rice Producers in Pakistan Punjab.American Journal of Agricultural Economics, 71:303-310.

Ali, M. and D. Byerlee (1991).Economic Efficiency of Small Farmers on a Changing World: A Survey of Recent Evidence. Journal of Development Studies, 4: 1-27.

Ali, F., A Parith and M. K Shaha (1994). Measurement of Profit Efficiency Using Behavioral and Stochastic Frontier Approach. Applied Economics, 26: 81-188.

Azhar, R. A (1991). Educational Efficiency During the Green Revolution in Pakistan. Economic Development and Cultural Change, 39(3): 651-665.

Birkhaeuser, D, Evenson, R.E. and G. Fedder (1991).The Economic Impact of Agricultural Extension: A Review. Economic Development and Cultural Change, 39 (3): 607-650.

Battese, G.E, and G. S. Corra (1977). Estimation of Production Frontier Model with Application to the Pastoral Zone of Eastern Australia. Journal of Agricultural Economics, 21: 169-79.

Battese, G. E. and T. J. Coelli (1992). Frontier production Function, Technical Efficiency and Panel Data: With Application to paddy farmers in India. The Journal of Productivity Analysis, 3: 153-159.

Battese, G. E. and T. J. Coelli (1995). A Model for Technical Inefficiency Effects in Stochastic Frontier Production for Panel Data. Empirical Economics, 20: 325-45.

Bravo-Ureta, Boris E., and E. Antonio Pinheiro (1993). Efficiency Analysis of Developing Country Agriculture: A Review of the Frontier Function Literature. Agricultural and Resource Economics Review, 22(1): 88-101.

Bravo-Ureta, Boris E., and E. Antonio Pinheiro(1997).Technical, Economic and Allocative Efficiency in Peasant Farming: Evidence from Dominican Republic. The Developing Economics, XXXV(1): 88-101.

Choudhuri, D. P (1968). Education and Agricultural Productivity in India, PhD Thesis: University of Delhi, Delhi.

Coelli, T.J (1996). A Guide to FRONTIER Version 4.1c: A Computer Programme for Stochastic Frontier Production and Cost Function Estimation, Working Paper 96/07, Centre for Efficiency and Productivity Analysis, Dept. of Econometrics, University of New England, Armidale, Australia.

Duraiswamy, P.(1994).Technical and Allocative Efficiency of Education in Agricultural Production: A Profit Function Approach. The Economic Journal , XXV (1):17-32.

Farrell, M. J (1957).The Measurement of Productive Efficiency. Journal of Royal Statistical Society, CXX(3): 253-290.

Green, W. H. (1980). Maximum Likelihood Estimation of Econometric Frontier Functions. Journal of Econometrics, 13: 27-56.

Grilliches, Z (1964). Research Expenditures, Education and Aggregate Agricultural Production Function. American Economic Review , 54: 961-74.

Huffman, W., (1977). Decision Making: Allocative Efficiency: The Role of Human Capital. Quarterly Journal of Economics, 91 (5): 1-4.

Jondrow, J, C. A, Knot Lovell, Vans Materov and Peter Schmidt (1982). On the Estimation of Technical Efficiency in the Stochastic Frontier Production Function Model. Journal of Econometrics 19 (2/3): 233.38.

Kalirajan, K (1981). The Economic Efficiency of Farmers Growing High Yielding Irrigated Rice in India. American Journal of Agricultural Economics, 63 (3): 566-70.

-------------------- (1991). The Importance of Efficient Use in the Adoption of Technology: A Micro Panel Data Analysis. Journal of Productivity Analysis, 2(2): 113-26.

Karafillis, C and E. Papanagiotou (2009). Innovation and Profit Efficiency in Organic Farming. World Journal of Agricultural Sciences, 5(1) :74-82.

Kumbhakar, Subal C &, Arunava, Bhattacharyya (1992). Price distortions and Resource Use Efficiency in Indian Agriculture: A Restricted Profit Function Approach. The Review of Economics and Statistics, 74(2): 231-39, May.

Lockheed, M., Jamison, D. and Lau, L. (1980). Farmer Education and Farm Efficiency: A Survey. Economic Development and Cultural Change. 29 (1): 37-76.

Meeusen, W. and J. Van den Broeck (1977). Efficiency Estimation from Cobb-Douglas Production Function with Composed Error. International Economic Review, 18: 2 (June), 435-44.

Mohapatra, R (1998). Effects of Education on Technical and Allocative Efficiency in Farm Production: Evidence from Orissa. Indian Journal of Economics, LXXIX (312): 81-98.

Nelson, R and Phelps, E. (1966). Investment in Humans Technological Diffusion and Economic Growth. American Economic Review, 56: 69-75.

Nganga, S.K, J. Kungu, N. De Rider, and M. Hervoro (2010). Profit Efficiency Among Kenyan Small Holders Milk Producers: A Case Study of Meru- South District , Kenya. African Journal of Agricultural Research, 5(4): 332-337.

Ogundari, K. and S.O. Ojo (2006). An Examination of Technical, Economic and Allocative Efficiency of Small farms: The Case Study of Cassava Farmers in Osun State of Nigeria. Journal of Central European Agriculture, 7 (3): 423-42.

Pudasaini, S (1983). The Effects of Agriculture: Evidence from Nepal. American Journal of Agricultural Economics, 65(3): 509-515.

Ram, R (1980). Role of Education in Production: A Slightly New Approach. Quarterly Journal of Economics, 95(September): 365-73.

Rehman, S. (2002), Profit Efficiency Among the Bangladeshi Rice Farmers, School of Economic Studies, The University of Manchester, Oxford Road Manchester, M139PL England, UK.

Schultz, T. W (1964). Transforming Traditional Agriculture, New Haven, City: Yale University Press.

Squires, D. and Steven Tabor (1991). Technical Efficiency and Future Production Gains in Indonesian Agriculture. Developing Economies, 24(3): 258-70.

Yotopoulos, P. A, and Lau, L. J. (1973). A Test for Relative Economic Efficiency: Some Further Result. American Economic Review, 49(1-3): 476-495.

Wang, J, Cramer, G. L., and Wailes, E.J (1996). Production Efficiency of Chinese Agriculture: Evidence from Rural Household Survey Data. Agricultural Economics, 15: 7-28.

Welch, F (1970). Education in Production, Journal of Political Economy, 78(1): 32-59.