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A comparison of yield of paddy cultivation under owner-cultivated land and leased-in land in Batticaloa District, Sri Lanka

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Abstract

Batticaloa is one of the foremost paddy producing districts in Sri Lanka which occupies the 6th place in paddy production and contributes 4.9 percent to Gross Domestic production. In Batticaloa districts, farmers are engaged on both owner-cultivated land and tenant -cultivated land. When comparing owner-cultivated land and tenant -cultivated land, there are significant facilities which need to be considered as the availability to gain the assistance regarding paddy farming which are feasible to only who holds the land ownership. Therefore, the absence of ownership may become as barriers in accessing government assistance which could lead to the difference in obtaining yield. In this context, the study examined the difference of yield between tenant – cultivated land and owner- cultivated land and explored the factors which influence on technical efficiency. The study is established on primary data, which was gathered during the 2015/16 paddy Maha season by a structured questionnaire in Batticaloa district. Four hundred samples of farmers were selected on a combination of snow ball sampling and random sampling technique. The gathered data were analyzed by using stochastic frontier production function and Tobit model. The results reveal that, yield of paddy on tenant -cultivated land was not less, compare to owner- cultivated land as since there is a slight difference between tenant - cultivated land and owner-cultivated land in term of yield. It may be concluded that even if there is absence of ownership among tenant cultivated land, it does not lead to reduce more paddy yield it may attributed due to the provision of tenancy givers to tenancy takers.

Keywords: Farmers, owner-cultivated land, paddy production, tenant-cultivated land, tenancy givers, tenancy takers, yield.

Introduction

Rice has been the predominant food of half of the world's population. Both rice and wheat are the key crops in agriculture sector in the world[1]. Specifically, Paddy is the most essential food in Asian countries where it is mostly cultivated. It contributes mostly as an economic crop for paddy farmers and laborers who engage in paddy cultivation for their basic livelihood[2]. Similar to other Asian countries, Rice is the main food of the people and it occupies the largest part of land in Sri Lanka.

Paddy is cultivated nearly in all parts of the country, except at very high altitudes"[3]. Among these, Ampara, Polonnaruwa, Kurunegala, Anuradhapura, Hambantota and Batticaloa districts highly contribute to Sri Lankan economy through paddy cultivation. Thus, Batticaloa district being asa major paddy producing districts in Sri Lanka which occupies the 6th place in paddy production and contributes 4.9 percent to total national production[4].

Likewise, the economy of people in Batticaloa district depends mostly on agriculture and fishing for livelihood. In Batticaloa, distribution of total population by the settlement is around 407,974 urban and 586,601 rural. Approximately 69 percent of the population lives in rural areas and most of them engage on paddy sector as well as the paddy sector offers employment opportunities for rural laborers in Batticaloa district[5].

The data for Batticaloa district does not explain a clear trend as well as paddy farmers have not obtained a steady growth on paddy yield. Similar to these data[6] scholars who stated that paddy farming has been experiencing a low productivity in Batticaloa district. However, increasing the local production of paddy is the key objective of every government[3]. Hence, Sri Lankan government has been supporting agricultural sector to increase paddy yield since independence. Consequently, government intervention has been rising in recent years in various forms to give a hand to paddy cultivation. Although, these assistant systems are not fully reachable by the local famers since there are issues involved regarding land ownership of the cultivated paddy in Sri Lanka.

In Batticaloa district farmers use approximately 61,321 hectares of paddy land in out of total land to cultivate paddy seed[5]. Nevertheless, not all of them own paddy land for cultivation. Hence farmers, who encounter the shortage of paddy land, have to rely upon tenancy givers. Thus, tenancy givers give their land to other farmers to cultivate seed paddy under the land tenancy system. Further, farmers gain more lands to increase the space

for paddy cultivation in Batticaloa district. For this reason, farmers gain paddy land under the land tenancy system, even if they have own paddy land. Thus, tenancy givers and tenancy takers are willing to transfer land for lease under the tenancy. Further, land tenure systems have not been modified properly in countries to develop agriculture sector[7]. In particular, tenancy cultivated land may not provide feasible to farmers to induce stable growth of paddy production. In Batticaloa district, most of the tenancy agreements do not have a form of written contact. It associates mostly with verbal agreements and made alone without any legal evidence. When tenant farmers engage on tenancy land, they do not access assistance regard paddy cultivation due to the informal tenancy system. Even if the government of Sri Lanka assists for paddy sub-sector in many forms, all paddy farmers don't get the access to assistance from the government. These farmers are not considered eligible to gain assistance, since they do not own the land. Even if they have tenancy land, it should not have ownership. Therefore, tenancy takers cannot access to government assistance as the government assistance depends more on land ownership.

In this background, there may be distinction in the use of inputs on paddy cultivation among both owner- cultivated land tenant cultivated land. This may lead to produce efficient yield in paddy sector between owner cultivated land and tenancy cultivated the land.

Problem statement: "Accessibility to gain government assistance corresponding to paddy cultivation, which is feasible to only who has ownership of land". Therefore, tenancy takers are not able to obtain this government assistance. The absence of ownership may become as barriers in accessing government assistance which could lead to the difference in obtaining yield.

Research Question: The main questions of this study are as follow: i. Is tenant- cultivated land less efficient than owner-cultivated land in term of yield in Batticaloa district? ii. What are the socio-economic factors and institutional aspects that influence on technical efficiency of both owner cultivators and tenant cultivators?

Research Objectives: The key objectives of this study are as follow: i. To analyze whether the tenant land is less efficient than owner land in term of yield in Batticaloa district. ii. To identify socio-economic factors and institutional aspects that influence on technical efficiency of both owner cultivators and tenant cultivators.

Literature Review: The literature review is conducted basis of a number of empirical analysis which is closely related to this research study. A study[8] estimated facts and issues in the basis of rice land ownership and lease systems in Southeast Asia using regression analysis. The study highlighted that a stable demand for land lease drove in both small farm size and higher rent regardless of the level of yield. Although, form of tenancy agreement and tenure status are comparatively insignificant determinants of productivity and rice technology.

Authors[9] exposed that owner cultivated land increases the average land productivity. Additionally, they were reported that sharecropping system get eight percentages less than owner cultivated land. Under the sharecropping system, total input use and yield are lower than other tenancy provision.

Scholars[10] conducted the study to explore the impacts of land tenure systems on productivity of resource use and efficiency in Ghana. They exposed that fixed rent would reduce the inefficiency of paddy production. Similarly, owned land also reduces the inefficiency of paddy production.

To investigate the factors influencing rice production and technical efficiency of rice farmers a study conducted using stochastic frontier production in Philippines[11]. Their results found that tenant cultivated land is less productive compare to owner cultivated land, whereas owner cultivated land has been more productive. In addition, they exposed tenant cultivated land, educated females and dry season farming increase the technical inefficiency. Particularly, farms operated under tenancy system tend to being higher technical inefficiency.

A study[12] reveals that the ownership induces to enhance the long term agricultural investments and higher productivity via security effect of land. Conversely, insecure land right restricts the investment causes create disincentive to farmers to spend resources on land improving inputs. It leads to low productivity of land. Thus, they mentioned noteworthy that, owner cultivated land higher in term of productivity and long-term investment due to higher security of cultivated land.

Authors[13] studied in the title of land reform and farm productivity in west Bengal based on sharecropping. They examined the impacts of tenant and owner cultivated farms on productivity by using implementation of Operation Bargaprogramme. They found that the programme, enhanced the yields of tenancy farmers as the registration of tenancy system has corresponded with a significant productivity effect of tenancy takers. If tenancy takers gain their tenancy land under the registration, then they can access credit from bank at low interest rate than informal interest rate when registered sharecroppers can use their lease documents to access credit. Subsequently, it would lead to enhance the productivity of tenants. Nonetheless, their evidence that the program raised yields on tenant farms, but they stated "this evidence was less reliable, owing to the low incidence of leasing".

The study was conducted in Nigeria to estimate the land rights and rental systems pursued by Sawah rice farmers using t-test. It was reported that assured land tenure system impacts the productivity sawahrice farming. In order to earn higher yield in future, tenancy takers and landless farmers require more secure access to tenancy land. If land is not secured, tenant cannot invest in more durable inputs. In order to enhance growth and investment in the paddy land, the tenancy system should ensure both secure rights and longer period of tenancieson land for tenants[14].

Secure land rights of individuals will increase inducements to undertake productivity enhancing land-related investments[15]. Not only secure land rights of tenant farmers but also well-functioning land rental and sales markets are also crucial in order to creating investment inducements. Up till now, restrictions of land rental and regulatory structures providing inadequate tenure security are general. Removing those restrictions on tenancy system and giving the legal rights on lease in land subsequently it will obviously enhance long-term investments and increase the productivity.

Insecurity of land rights delayed investment in both rural area and urban area. As a result, the agricultural sector has been experienced as poor performance in Ghana. Conversely, when farmer gain paddy lands with secured tenure tend to invest on it, then they can promote their land productivity[14,10].

A study[16] found out that productivity of paddy cultivation is better in informal operators compare to owner cultivators. When comparing productivity of land with informal land transaction and legally owned operator's land, the productivity of leased on cash land, pre-fixed produce land and mortgage land is higher than the productivity of owner cultivated land.

These empirical studies review shows that owner -cultivated land is more productive compare to tenant-cultivated land. Most of the studies have emphasized that to enhance paddy yield, it should ensure land security and well-functioning land rental. If farmers have secure land, which would lead inducement to long-term investment on land and increase the input use. Therefore, here it is necessary to analyse and compare yield of paddy cultivation under the owner-cultivated land and tenant-cultivated land.

Methodology

The survey was conducted in Batticaloa district in Eastern province of Sri Lanka, which is generally suitable for paddy production. Hence the selected target place was appropriate for this study since based on Central Bank Annual Report, it is being considered as one of the district in producing largest component of the paddy in Sri Lanka. The present study is employed with both primary and secondary data to the main research data analysis. The study is conducted on the basis of cross-sectional production data, which was collected during the 2015/2016 paddy production Maha season. Primary data was gathered by structural questionnaire survey from both owner farmers and tenant farmers. The interview also was conducted to gather further relevant data from selected farmers.

Combination of snow ball sampling technique and random sampling technique was used in the survey. Random sampling technique was employed to choice of area and the data was gathered through the structural questionnaire using the snowball sampling technique. It was used in the survey as there are no records about population of both owner farmers and tenant farmers. Total sample size of 200 owner farmers and 200 tenant farmers were chosen from Batticaloa district. Thus, a total of 400 respondents who were both owner farmers and tenant farmers were selected as samples for this study.

A stochastic frontier production function approach was estimated to examine whether the leased land is less efficient than owner land in term of yield.

The general form of the stochastic production frontier model is as follow:

$$LnYi=\alpha_0+\sum_{i=1}^{m} \beta_i lnX_{ij}+ (\nu_i+ u_i)$$

Where: lnYi denotes the log -transformed yield for jth farmer, X_{ij}indicates the log-transformed production inputs. β is a vector parameter, $\nu_i+u_i = \varepsilon_i$ denotes the composed error term and whereas ν_i is the two -sided error term and u_i is the one-sided error term.

The present study specified the empirical stochastic production frontier as follows:

$$\ln\gamma = \beta_0 + \beta_1 \ln X_1+ \beta_2 \ln X_2 +\beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 X_6+ \beta_7 X_7 + \varepsilon$$

Where: γ:yield (Kg per acre), X1:Size of land (acre), X2: Quantity of Seeds paddy (Kg per acre), X3:Quantity of Fertilizer (Kg per acre), X4:Number of Labour (per acre), X5: Quantity of pesticides (Litter for per acre), X6:Dummy for Irrigation (1:Rainfall 0:otherwise), X7:Dummy for type of land (1:Owner-cultivated land 0:Tenant-cultivated land), ε:The error term.

Then, the objective on socio-economic factors and institutional aspects that influence on technical efficiency of both owner cultivators and tenant cultivators was analyzed by estimating a Tobit regression model. From stochastic frontier production function approach, the technical efficiency scores were obtained in this study.

The structural equation of the Tobit model is expressed as:

$$y_i^* = X_i\beta + \varepsilon_i$$

Here, y_i^* denotes lalent variable for the ith paddy cultivation farm. X denotes a vector of independent variables which is expected to affect efficiency. The β's are parameters related to independent variables to be estimated. ε denotes the independently distributed error term.

In Tobit model, dependent variable is not normally distributed subsequently its values range between 0 and 1. The empirical Tobit model for this study is given as:

$$y_i^* = \beta_0+ \sum_{n=1}^{m} \beta n X_i + \varepsilon_i$$

Where: y_i^* denotes technical efficiency index of farmes i: X_1 = Age of farmers, X_2 =Gender, X_3 =Material status, X_4 = Household Size, X_5 =Education, X_6=Dummy for nature of paddy cultivation, X_7= Experience of farmers, X_8 = Dummy for training, X_9 = Dummy for credit assess, X_{10} =Extension service, X_{11} =Dummy for fertilizer subsidy.

Thus, the term of yield in paddy cultivation under tenant-cultivated paddy land and owner-cultivated land was studied by fitting Cobb-Douglas production function. Both Stochastic Frontier Model and Tobit model were analyzed via the STATA package.

Results and discussion

Empirical Results of Stochastic Production Frontier Analysis: This section reveals the results of stochastic production frontier analysis to examine whether the leased land is less efficient than owner land in term of the yield of paddy.

A Cobb-Douglas production function was estimated using the stochastic frontier production model, which is reported in the following Table-1.

The estimated coefficient of the Stochastic frontier production function is presented as

$$\ln\gamma = 6.831373 + 0.1722478\,x_1 + 0.0003158x_2 + 0.0458563x_3 - 0.614187x_4 + 0.0515069x_5 - 0.1408112x_6 + 0.1816103x_7 + \varepsilon$$

Where: dependent variable is (γ) yield of paddy cultivation. x_1 refers to the size of land, x_2 is quantity of seeds paddy, x_3 is quantity of fertilizer, x_4 is number of labour, x_5 is quantity of pesticides, x_6 is irrigation and x_7 is type of land.

Table-1: Stochastic frontier production function results.

Variables	Coefficient	Z	P>|z
Size of land	0.1722478***	4.39	0.000
Quantity of seeds paddy	0.0003158	0.00	0.996
Quantity of fertilizer	0.0458563	0.66	0.510
Number of labour	-0.614187	-1.63	0.103
Quantity of pesticides	0.0515069	1.21	0.228
Irrigation	-0.1408112***	-2.48	0.013
Type of land	0.1816103***	2.92	0.004
Wald chi2(6) = 38.67, Prob> chi2 = 0.0000, Loglikelihood = -327.7538, Likelihood-ratio test of sigma_u=0: chibar2(01) = 3.29 Prob>=chibar2 = 0.035			

*** denote the significant level of 1% level.

The result reveals that the type of land has a positive and statistically significant impact on the yield of paddy, at one percent level of significance. Coefficient elasticity is 0.1816103. The study utilized dummy variables for finding if be varies between owner cultivated land and tenant cultivated land (1= owner cultivated land and 0=tenant cultivated land). Consequently, the re-estimated coefficient for elasticity of owner cultivated land is 7.0129833. The coefficient for elasticity which was explained as the positive effect of owner-cultivated land with paddy yield at one percent level. It implies that if farmers engage in their own land it will lead to enhance the paddy yield, in particular if the owner- cultivated land to paddy farming is increased by 10 percent, paddy yield would be increased by 70.129833 percent. Moreover, the estimated coefficient elasticity of tenant cultivated land is 6.831373 indicating that tenant cultivated land has a significantly positive impact on the yield of paddy at one percent level in the study area. The result reveals that 10 percent increase in tenant cultivated land would correspond to an increase in the yield by 68.31373 percent. According to the result, there is a slight difference between tenant - cultivated land and owner-cultivated land in term of yield.

Entirely the results are exposed that there is no significant difference in terms of paddy yield in Batticaloa district, since there is a slight difference between tenant - cultivated land and owner- cultivated land. The result contrasts with the finding of previous studies in which owner - cultivated land has higher returns on paddy than tenant- cultivated land[9-11,14,18]. Cultivated land would be more productive and profitable compared to tenant - cultivated paddy land. In contrast, the study had not been found huge difference between tenant - cultivated land and owner- cultivated land in obtaining yield. It may have attributed due to the fact that tenant farmers obtained fertilizer subsidy with the help of tenancy givers as well as not all the tenant farmers depend on cultivation loan as they obtained credit via rice mill, pawning and samurdhi bank. The result supports the finding of a scholars[16] who highlighted that because of informal operators' dependency mostly on semi-formal financial institutions; the absence of legal land rights has not been a severe constraint to access credit. Further the study revealed that, most of the informal land transaction was among tenancy takers' friends or relations and there was no ill effect among relatives. According to the results, the present study indicates that tenant in land is not less efficient than owner in land in term of yield as there is no significant difference in obtaining yield.

Size of land has the coefficient elasticity of 0.1722478 indicating it has a strong significant and positive influence on paddy yield at one percent level. According to the results, an increase in the size of land by 10 percent it would increase significantly paddy yield by 1.72 percent. This implies that if farmers allocate more paddy land to paddy farming, they obtain higher in yields, which presents similar findings as those reported by previous authors who had observed that land size influenced positively on paddy production[9-12].

The result of irrigation showed a negative coefficient of -0.1408112 implies it has significantly negative effect on paddy yield at one percent level. If farmers irrigate the paddy land getting water from rainfall, the coefficient elasticity of rainfall is 6.6905618. Based on the results, a 10 percent increase in the watering of irrigation, it would reduce paddy yield significantly by 66.905618 percent. Moreover, if farmers increase watering by 10 percent to paddy land through pond it would reduce the yield of paddy by 68.31373 percent. When watering through pond, it reduces more the paddy yield compared to watering by rainfall.

The results indicate that more watering negatively diminishes paddy yield significantly, which is attributed to the fact that the increased over watering lead to increase the risk of plants failing which induced to occur reduction of paddy yield. The results corresponding to the previous study exposed that irrigation impacts negatively on land productivity and profits[9].

Factor of fertilizer was found to be insignificant. It has a coefficient elasticity of 0.0458563 which has exposed the insignificant impact of fertilizer on the yield of paddy. It means that if an increase in the quantity of fertilizer in the paddy field, it would not be associated with an increase in the yield of paddy in the study area. It was attributed to the fact that use of more quantity to per acre than recommended quantity it may not be help to produce more on paddy yield.

Further, factor of labor also found insignificant negatively, since the coefficient elasticity of – 0.614187 which implies that an increase in number of labour would not support to increase the paddy farming. This result also found in another studyin Batticaloa district[6]. A study[9]also present that there is no significant impact of labor on the yield of paddy. Though, the results contradict with the recent study in which labour has a positive impact on paddy productivity[10-12].

Moreover, factor of pesticide also does not correspond with the yield of paddy as it has a coefficient elasticity of 0.0515069 which indicates that pesticide is not significant in the paddy farming. According to the result of pesticide, an increase in the quantity of pesticide would not support to an increase in the yield of paddy in the study area. In general, pesticides are used only to prevent related diseases in the paddy farm. Therefore, it does not correspond with an increase the yield of paddy in the study area. Further, it may occur due to the use of more quantity of pesticide than recommended quantity that may lead for not corresponding to obtain the yield of paddy. The result replicates the similar findings as those reported by a study in which revealed that pesticide does not determine the paddy production[17].

Further, factor of seed paddy also has insignificant effect on paddy yield since it has the coefficient elasticity of 0.0003158. It means seed paddy would not be associated with paddy yield. According to the results, an increase in the quantity of seeds in the paddy field is not supported for more to increase the yield of paddy. This result contradicts with the findings of the studies that seed paddy effects positively on paddy production[10,11,17]. Even if farmer utilized more quantity of seed paddy in order to continue higher density of paddy plant population. Though, it has any kind of uncertainty in paddy land it may made barriers to efficient paddy seeds growth. Therefore, the present study found the result of seed paddy as being insignificant effect on paddy farming.

The model also was significant to support the objective. The log likelihood for the fitted model is -327.75 and the chi-square is 38.67 and it was significant at one percent level. Thus, the overall model used in the study was significant and the explanatory variables used in the model were collectively able to explain the variations in paddy yield.

Furthermore, the data was tested to check the fitness of the model. Accordingly, the data was checked for heteroscedasticity and the results showed that there was no problem of heteroscedasticity since probability was found 0.0088.

Similarly, the data was checked for multicollinearity test for variables. It was also done by using variance inflation factor (VIF) which was 1.15. The results also confirmed that there is no multicollinearity problem as there is no linear relation among explanatory variables. Further, the following table also represents the correlation results of independent variables.

According to the correlation results, there are no correlation among independent variables. Hence, the study can conclude that the model was fitted correctly for this study.

Entirely, results of Stochastic Production Frontier Analysis reveal that, size of land, owner cultivated land and tenant cultivated land found to be impacted positively on the yield of paddy. In contrast, irrigation affects negatively the yield of paddy in the study area. It is noted that factor of fertilizer, seed, and pesticide are not significant positively. Further, factor of labour found to be insignificant negatively. It shows that an increase in those factors in the paddy field would not support for more in the paddy farming in the study area. As discussed above, according to the result, owner cultivated land is not more efficient in term of yield compare to tenant- cultivated land since the study found only slight difference between tenant - cultivated land and owner- cultivated land.

Empirical Results of Tobit Regression Analysis: One of the objectives is to identify socio-economic factors and institutional aspects that influence on efficiency of both owner cultivators and tenant cultivators. Based on stochastic frontier model, Tobit model was occupied to identify the factors that determine the efficiency of the farmers. Estimated results of Tobit regression are reported in Table-3.

Table-2: Correlation results.

Variables	Land	Seed Paddy	Fertilizer	Labour	Pesticides
Seeds Paddy	-0.0427				
Fertilizer	0.0391	-0.0583			
Labour	-0.1686	0.1195	0.0795		
Pesticides	-0.1188	0.1709	0.2103	0.1180	
Irrigation	-0.1339	0.1264	-0.0859	0.0395	0.0154

According to the result, technical efficiency of paddy farmers ranges from 0.316 and 0.926. further its mean value is 0.77 in the study area it suggests that on average the paddy farmers incur approximately 31 percent of losses in the yield of paddy due to technical inefficiency. Further, estimated Tobit regression results reveal that among the selected variables, only three factors are found to have a significant influence on technical efficiency. Among the institutional factors, fertilizer subsidy and extension services influence on technical efficiency. Though, gender of farmers only contributes to determine the technical efficiency among the socio-economic factors.

According to the findings, gender has a coefficient elasticity of 0.0319878 which implies a positive and significant relationship at 5 percent level. In particular, the estimated coefficient of male farmers is 0.7136943 which explains that an increase in the male farmers by 10 percent among the entire farmers, the level of technical efficiency is increased by 7.1 percent. If female farmers engage on paddy farming, their estimated coefficient is 0.6817065, which indicates that if an increase in female farmers by 10 percent it would lead to an increase of technical efficiency by 6.8 percent. The results have showed clearly, that if male farmers engage on paddy farming, then they can influence more on technical efficiency compared to female farmers. It may be attributed due to male farmers can effort more than female farmers in paddy farming activities.

Except gender, other socio-economic factors are found to be insignificant with technical efficiency. In particular, marital status, household size, education and type of owner are insignificant positively. On the other hand, experience, training and nature of paddy farming are insignificant negatively with technical efficiency in the study area. Thus, the results have found those socio-economic factors do not determine the technical efficiency in the paddy farming. It may be attributed because of the other unidentified factors may influence on technical efficiency of farmers.

For instance, in this study, experience is not significant with technical efficiency, here if a farmer possesses a few years of experience, they may have a new technology compare to other farmers who may have more experience. As a result, only experience would not influence on technical efficiency.

According to the result, type of owner also is not influenced on technical efficiency. If farmers are the owner of the paddy land, they would not determine the technical efficiency as type of owner has coefficient value of 0.00310708 which implies insignificant effect. Similar to owner farmer, tenant farmer also does not influence on technical efficiency since tenant farmer also has found insignificant coefficient. According to the study, even if farmers are engaged on either owner cultivated land or tenant cultivated land, it would not affect the technical efficiency in the study area. In this concept both farmers have similarity in term of technical efficiency, since they do not influence on technical efficiency. The results dissimilar with the findings of previous study revealing owned land significantly increase technical efficiency of rice farms, whereas tenant cultivated land significantly decrease technical efficiency of rice farms[19].

Table-3: Tobit regression estimates.

Variables	Coefficient	t	Probability
Age	-0.00653	-1.19	0.233
Gender	0.0319878**	2.07	0.039
Marital status	0.0035431	0.40	0.689
Household Size	0.0036437	1.01	0.315
Education	0.0003412	0.07	0.941
Nature of paddy cultivation	-0.0147373	-1.40	0.162
Experience	-0.0001873	-0.41	0.681
Training	-0.0017337	-0.14	0.890
Credit access	0.0151156	0.88	0.381
Extension service	-0.0088733**	-2.07	0.039
Fertilizer subsidy	0.0260719**	2.40	0.017
Type of owner	0.00310708	0.30	0.765
Log likelihood: 372.28908, LR chi2(12) = 29.13, Prob> chi2 = 0.0038, Pseudo R2 = 0.0407			

**Denotes statistically significant at 5 percent level.

Under the institutional factors, the present study is carried out with fertilizer subsidy, extension service, farmer's training and credit access. Among those institutional factors fertilizer subsidy and extension service are found to be significant with technical efficiency.

Fertilizer subsidy has the coefficient value of 0.0260719, which indicates that fertilizer subsidy positively significant with the technical efficiency. If farmers obtain fertilizer subsidy, it would lead to an increase in the technical efficiency of farmers. According to the result, farmers who obtain fertilizer subsidy upgraded their technical efficiency levels by 0.7077784 percent compared to those who miscarried to obtain fertilizer subsidy. It indicates that if farmers obtain fertilizer subsidy, which would encourage the farmers. Thus, technical efficiency is also induced in accessing fertilizer subsidy.

In contrast, extension service is negatively significant with technical efficiency as the coefficient value is -0.0088733. It explains that an increase in the extension service by 10 percent will reduce the technical efficiency by 0.088733 percent. It may be attributed due to inefficiency and lack of extension services. In general, whoever access extension services, they can acquire information relative to paddy diseases and their control methods. Further they can access innovative farming techniques to the use of input.

If extension service is efficient it would lead to a higher yield. According to the farmers stated in an interview, most of the farmers are not satisfied with the term of extension service. The extension service provides directly to farmer organizations' members. They fail to distribute the extension service. Furthermore, farmers do not gain the extension service on time. Thus, farmers feel the inefficiency of extension service which may lead to face the negative situation.

Further, other institutional aspects namely credit access and training were insignificant with technical efficiency as those factors have coefficient of 0.0151156 and -0.0017337 respectively. The result has showed, whether credit access positively insignificant and training negatively insignificant with technical efficiency. The influence of credit access and training access on technical efficiency might be due to the circumstance that approximately 172 percent of farmers and 162.5 percent farmers who did not access training and credit.

The result contrast to prior study indicating farmers having access to credit achieved a higher efficiency level through adopting the improved technology in agricultural production and thus the positive role of credit access as a beneficial element to improving technical efficiency[20]. Therefore, if farmers having opportunity to access cultivation loan to lower interest from government, it can be induced the technical efficiency of farmers.

Further, the estimated chi-square was 29.18 and it was significant at one percent level. The log likelihood for the model was a relatively large value of 372.3 indicating that the model was correctly specified. Moreover, pseudo R-squared is 0.0407 which was considerably low. Though, Tobit regression does not have an equal R-squared that is found in OLS regression. Since, "pseudo R-squared does not mean like R-square of OLS regression that proportion of variance of the response variable explained by the predictors"[21,22].

Conclusion

The study was conducted in the Batticaloa district among owner farmers and tenant farmers on paddy farming to investigate the difference between owner cultivated land and tenant cultivated land in term of yield. Furthermore, the study also analysed the socio economic and institutional aspects which determine the technical efficiency of the both owner cultivators and tenant cultivators. The study found that there is no significant difference in term of paddy yield in Batticaloa district since there is a slight difference between tenant - cultivated land and owner- cultivated land. In Particular, yield of paddy on tenant - cultivated land was slightly lower compared to owner-cultivated land. It seems that tenant in land is not less efficient than owner land in term of yield in Batticaloa district.

According to the results, size of land, irrigation and type of cultivated land are impacted the yield of paddy since those being significantly with paddy yield at one percent level. Though, factor of irrigation negatively affects the yield of paddy because of negative significance. Other factors are not found to be significant with paddy yield. In particular, inputs namely fertilizer, seed, and pesticide have found to be as being insignificant positively respect to the yield of paddy in the study area. Moreover, labour are also not associated with the yield of paddy as it also being insignificant negatively respect to paddy yield. Further, estimated Tobit regression results reveal that among the institutional factors, fertilizer subsidy and extension services influence on technical efficiency. Though, gender of farmers only contributes to determine the technical efficiency among the socio-economic factors. Likewise, even if farmers are engaged on either owner cultivated land or tenant cultivated land, it would not affect the technical efficiency in Batticaloa district.

Entirely, the study concludes that there is no significant variance between owner- cultivated land and tenant -cultivated land in term of yield in Batticaloa district since being a slight difference. It may be attributed due to the assistance of tenancy givers to tenancy takers. Nonetheless, if tenancy takers obtain their tenant land under the registration then, similar to owner farmers, tenancy takers also can access government assistance easily. It would be lead to use of higher amount of inputs and reduce higher cost of inputs and rent. Further, tenant farmers may can take not only short-term process but also long-term process on the tenant land to obtain higher yield.

Therefore, the study suggests that if the government and tenancy givers take necessary actions to ensure proper tenancy system to

obtain government assistance easily, it would lead to more to obtain higher yield.

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