American Journal of Humanities and Social Sciences Research (AJHSSR)
e-ISSN :2378-703X
Volume-5, Issue-4, pp-86-95
www.ajhssr.com
Research Paper Open Access

MICRO-ECONOMIC IMPACT OF FERTILIZER SUBSIDY IN PADDY CULTIVATION IN SRI LANKA

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ABSTRACT:Concerning Paddy cultivation, it is one of the major sectors of livelihood of Sri Lanka employing for more than 1.8 million people. Therefore, it is necessary to evaluate the fertilizer subsidy given for the paddy sector. Mahaweli Development Project is one of the most important projects regarding agriculture sector in Sri Lanka. The contribution of paddy yield under that areas are much higher than the other areas in Sri Lanka. Evaluating that micro level sector of paddy farmers is timely important regarding fertilizer subsidy scheme in Sri Lanka. Therefore, the objective of the study is to evaluate microeconomic impact of fertilizer subsidy in Sri Lanka with special reference to Murawesihena Block under Udawalawe irrigation system.Primary data was gathered from 110 farmers inMurawesihena Block in order to find the impact of fertilizer subsidy in micro level. Multiple regression analysis and Cobb-Douglas Production function were used to analyze the impact of fertilizer usage. In this study, it was found that, there is a positive relationship between fertilizer usage and average paddy yield in the study area. However, the contribution of that amount is a little bit amount compared to other variables in the model. Furthermore, in order to increase the yield, it should be used more capital-intensive paddy farming methods than labor intensive methods by reviewing study results. So, it can be concluded that, the need of existence of all farmers inclusive fertilizer subsidy scheme in Sri Lanka with the assistance of Mahaweli Block Management Offices.

Key Words:*Fertilizer Subsidy, Microeconomic impact,Murawesihena Block, Paddy Cultivation*

I. BACKGROUND AND PROBLEM STATMENT

The term “Subsidy” is a phenomenon that has been studied all over the world among many scholars within past decades. The implications behind this word are therefore vast in many aspects such as economic, social, and environment. Even though, many studies are being conducted, the problem of subsidy is still continuing. Not almost all the outcomes are bad, yet it is helpful to overcome many issues such as food security and self -sufficiency, poverty alleviation, providing employment opportunities, encourage innovation and investment, increasing production and protect socially vulnerable groups (Gulati & Sharma 1995, Bach et al.2000 and Morris et al.2007). But it may be evolved with many economic inefficiencies; higher burden on government expenditure, the bad impact on production causing over usage of inputs, environmental and social inefficiencies; negative environmental externalities, human diseases etc. (Beers & Bergh 2001, Dorward&Chirwa 2011). Therefore, evaluating subsidy program is timely important in any aspects in order to overcome with the issues.As many other countries, fertilizer subsidy plays a significant role in agricultural policy in Sri Lanka. Since rice is the staple food in Sri Lanka, it is important to explore the impact of fertilizer subsidy on total paddy production in Sri Lanka in microeconomic aspect. Paddy cultivation of Sri Lanka is accounted for 36% in total cultivated area (Department of Agriculture, 2018). It is cultivated during Yala and Maha seasons which a higher yield is received in Maha Season (Central Bank of Sri Lanka, 2018). Fertilizer subsidy policy plays a major role in paddy cultivation because it has put a higher emphasis on this topic due to major macro and micro level consequences (Perera, Rathnayake& Fernando 2014).There were three main components given under the subsidy program such as urea, triple super phosphate (TSP) and potassium chloride (MOP).With the different views and modifications, we can identify five major phases of changes in fertilizer subsidy from its beginning in 1962 (Ekanayake 2005, Weerahewa et al. 2010, Central Bank of Sri Lanka, 2007–2012, cited by Bhavan &Maheshwarathan, 2012).

Period 1: 1962-1989 -Subsidy provided for three main fertilizers (Urea, TSP & MOP)
Period 2: 1990-1994 -Subsidy removal
Period 3: 1995-1996 -Re introduced and Subsidy provided for three main fertilizers (Urea, TSP & MOP)
Period 3: 1997-2005 -Subsidy provided only for Urea
Period 4: 2005 onwards- Subsidy provided for all three fertilizers (Urea, TSP & MOP)

Concerning Paddy cultivation, it is one of the major sectors of livelihood of Sri Lanka employing for more than 1.8 million people. Therefore, it is necessary to evaluate the fertilizer subsidy given for the paddy sector. As other developing countries, fertilizer subsidy has become a politically sensitive issue in Sri Lanka, since paddy farmers are the majority of voters in the country (Jayne & Rashid 2013, Thenuwara 2003). According to past researchers, it can be stated that there are many issues regarding fertilizer subsidy considering the introducing years of the subsidy. For example, the subsidy has originally given to the paddy farmers without having any supervision or clear resource allocation process. This caused to receive fertilizer subsidy for farmers who are wealthier. This issue created a problem with black market prices for fertilizers hence the fertilizer subsidy was not received for the farmers who should it be received (Thibbotuwawa 2010).

There were many consequences in fertilizer subsidy in micro level, due to corruption, poor relationship of farmers and service providers, black market involvement and misallocation of resources. Even though, fertilizer subsidy caused to improve the paddy production, some farmers have misused it selling to other vegetable farmers at a higher price (Weerahewa et al. 2010, Shantha, Ali &Bandara 2012). As well as misallocation of resources cause to make black market through receiving fertilizer subsidy by wealthier farmers. Although the government has continuously provided the fertilizer subsidy on paddy farmers, the overuse of fertilizer has badly affected to cause many problems in the agriculture sector (Rajapaksa &Karunagoda 2009, Weerahewa et al. 2010). Even though, many researchers have conducted researches to explore environmental, social and health impact of fertilizer subsidy (Ashoka, Ben, Janendra& Kosala, 2011), yet, no enough evidences to examine the microeconomic impact on fertilizer subsidy within Sri Lankan context.Providing subsidy at a higher price relation to world market price changes, led to a lower utilization of fertilizers among farmers (Central Bank 2014) due to weaknesses in fertilizer subsidy. In addition, there was a misallocation of fertilizer as the government selected farmers who has 5 acres for giving subsidy (Wijethunga, 2013) due to the inefficiency of subsidy scheme.The Agrarian Service Center plays a major role in distributing fertilizers for farmers. However, it can be stated that the interrelationship between farmers and service centers was not better enough to achieving their targets. As well as some corruptions, misallocations and low-quality chemical fertilizers are the other questions regarding subsidy program (Jayasumana et al 2014). As a developing country, it should be considered about the micro level impact of the fertilizer subsidy program since there are some important implications regarding micro level paddy cultivation. Even though the rice production of Sri Lanka has been gradually increased over the past years, there could be seen a stagnating production of paddy in some major paddy cultivated areas causing a big issue to the economy (Department of Agriculture 2005). Due to the lower profitability of paddy production, some farmers have moved to the other crops by giving up paddy cultivation (Silva et al 1999). As a very succeeds massive project of agriculture in Sri Lanka, Mahaweli Development project seems to be evaluated in the sense of achieving higher yield in different areas of Sri Lanka. But the attention on that special areas is not much enough to have a better clarification about the paddy cultivation in Sri Lanka.The paddy fertilizer subsidy scheme was continuing over the past decades with different modifications in time to time and it marks considerable issues in the economy. Despite many past evidences of researchers, that favorable and unfavorable economic consequences are led in the Sri Lankan economy in micro level aspect which has not yet discovered by the past researchers.

The main objective of the study is to explore the microeconomic impact of Fertilizer Subsidy in Mahaweli DevelopmentArea of Southern Sri Lanka under Udawalawe Irrigation System. Further, it finds whether the micro level of paddy cultivation should be capital intensive or whether it should be labor intensive as a specific objective.

This paper is organized as follows: first, it makes an introduction to the fertilizer subsidy scheme and then it reviews the literature on microeconomic impact of fertilizer subsidy in paddy cultivation. Based on the literature review, hypothesis is formulated. Then the study describes the materials and methods while results are presented and discussed in the next section. Finally, it concludes the paper by reviewing its contributions and policy implication.

II. LITERATURE REVIEW

The term ‘Subsidy’ was originated reference to expenditure incurred by the government which granted for the beneficiaries which is not recovered from the particular person (United Nations 1968). Subsidy can be identified as direct subsidy and indirect subsidy. Direct subsidy is taken as the form of cash with reference to a relevant material good. However, granting indirect subsidy can be seen as a form of reduction in taxation, imposing minimum and maximum prices for agricultural products, providing research and development cost at a lower cost, discounting etc. Therefore, a subsidy can be identified as “any value which keeps a lower price for consumers, or keeps a higher price for producers above the market price, by giving direct or indirect support (Moor &Calamai, 1997).The fertilizer subsidy was given for the farmers those who have a legal ownership for their lands. (Ekanayake, 2005, Rajapaksa &Karunagoda, 2009, Weerahewa et al., 2010). The government of Sri Lanka annually spends nearly 50 billion rupees (Sri Lanka Rupees) to import 750000 tons of fertilizer. With the

scheme, a 50kg bag of fertilizer was given for Rs. 350 and hence it could affect to cause some consequences such as increasing yield, improved food safety and reduction of negative environmental externalities (Weerahewa et al., 2010, Ministry of Finance and Planning, 2014,2016, 2017, Ponweera&Premaratne, 2011).There are number of models to explore the agriculturally based crops inputs and output in order to make decisions regarding this aspect. Among them, cost function approach, profit function approach and production function approaches are widely used. Cobb-Douglas production function is the widely used method for this purpose according to past researches (Diewert, 1971).Fertilizer usage as a main variable in agriculture sector, has been discussed by many researchers over the past years. When considering the global context, Griliches (1958) and Heady and Yeh (1959) has evaluated the aggregate demand for fertilizers in United States with the changes of their prices during the period of 1911 to 1956. According to Boyle (1982), he used the fertilizer usage estimating cost function approach to evaluate the usage of three main fertilizers in USA. Burrell (1982) estimated the fertilizer demand using different approaches in United Kingdom. Mulyadiana, Marwanti&Rahaya (2018) estimated the effectiveness of fertilizer subsidy policy in Karanganyar Regency in Indonesia using key variables such as, Rice production (Y), Land area (X1), Use of urea fertilizer (X2), Use of NPK fertilizer (X3), Use of labor (X4), Use of seed (X5) and effectiveness of fertilizer subsidy policy (X6).There are lots of studies that have evaluated the impact of fertilizer subsidy with special reference to paddy production for mainly used three fertilizers (Nitrogen, Phosphorous and Potassium) in both developed countries and developing countries. Fertilizer demand and usage is differed from one country to another due to some major facts such as climate, technology, soil fertility and sociological factors. In here, it is reviewed that different perspectives regarding fertilizer subsidy.

Not only in the global context, there are number of researchers have used the fertilizer usage as a main variable which impacted on fertilizer subsidy. Gunawardena and Flinn (1987) used fertilizer usage to estimate the short run production function using primary data in order to evaluate the impact of fertilizer subsidy on paddy production. Chandrapala& Silva (1988) estimated the fertilizer usage in main crop cultivations such as tea, rubber, coconut and paddy in Sri Lanka in order to ascertain whether the fertilizer subsidy should be removed or not. Ekanayake (2006) and Wijethunga& Saito (2017) estimated the fertilizer usage using demand and supply models with reference to fertilizer subsidy scheme for paddy in Sri Lanka.Idiong (2007) evaluated the production function using the stochastic frontier method by taking land, labor, seed inputs and fertilizer inputs as explanatory variables while, paddy output as dependent variable observing majority of farmers who have not used fertilizer due to some beliefs. Mishra &Marothia in 1975 investigated a similar method in a study of India as above using those dependent and explanatory variables. Another research was found in US which was conducted by Khan & Heady in 1972 using production function for paddy with same variables.Kukuchi&Aluwihare (1990) has estimated a fertilizer response function using average yield as dependent variable anduse of Nitrogen fertilizer as their explanatory variable in order to evaluate the long-term macro impact of fertilizer subsidy since independence.Chandrasiri&Karunagoda (2008) evaluated the paddy production function using land, machinery, agrochemicals and fertilizer inputs in different regions in Sri Lanka in order to make relationship between them. Karunaratne &Herath (1989) estimated the efficiency of rice production function in Sri Lanka with some variables. Farm size, agro-chemical cost, labor, fertilizer usage for Maha and Yala seasons were taken as explanatory variables while paddy production was taken as the dependent variable. Kanthilanka&Weerahewa (2019) estimated the production function using paddy yield as the dependent variable and trend, irrigation, season, machinery, fertilizer usage and labor as explanatory variables in their study. Rajakaruna in 2016 has examined the descriptive statistics of that context similar to above variables in order to find out the impact of fertilizer usage on paddy production. Land, labor, fertilizer and pesticides were considered as explanatory variables while yield of paddy was considered as the dependent variable by Bhavan &Maheshwarathan in 2012.According to past theoretical literatures, it can be concluded that the production function is an appropriate model to examine the relationship between yield of paddy and fertilizer usage (Bhavan &Maheshwarathan 2012, Rajakaruna 2016, Karunaratne &Herath 1989, Chandrasiri&Karunagoda 2008, Idiong 2007, Perera, Rathnayake& Fernando 2016, Wanninayake&Semasinghe 2012,Shantha& Ali (2014) Gunawardena & Flinn 1987). This was adopted globally as well as within Sri Lankan context with respect to fertilizer subsidy in paddy cultivation.

H1: Fertilizer usage has a positive relationship with average paddy yield

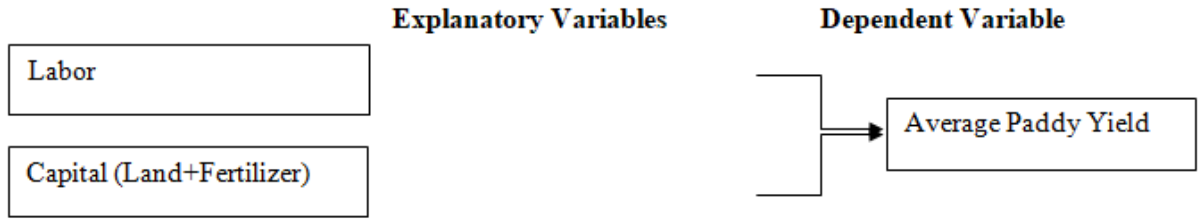
Reviewing past literatures, it can be stated that most of the researchers have found that there is a positive relationship between fertilizer usage and average paddy yield (Ekanayake 2006, Shantha et al.,2013) Findings by Ekanayake in 2006 again confirmed by the World Bank (2007) and the Department of Census and Statistics, Sri Lanka (2011) concluding that average paddy yield is positively related to the fertilizer usage. Chandrapala& Silva (1988) examined the impact of fertilizer usage in main crops fields in Sri Lanka. The results indicated that removing of fertilizer subsidy will be worsen for paddy production in Sri Lanka implying that there is significant positive relationship between yield of paddy and fertilizer usage.Another study done by

Chandrasiri&Karunagoda (2008) explored the relationship between yield of paddy and other explanatory variables such as land, machinery, agrochemicals and fertilizer usage concluded that it can be seen regional differences in usage of fertilizer. As noted by them, there is a high technical efficiency in North Province than North Western province. Wijetunga, Thiruchelvam, and Balamurali (2008) indicated that, during 2005-2008, there is an increase of paddy yield with the increase in fertilizer usage. The use of fertilizer has caused to increase the changes in subsidy scheme by 32% and the yield has increased by 17%.Karunaratne&Herath (1989) explored the efficiency of rice production which derived production functions for both Yala and Maha seasons. The results indicated that land was recorded as a significant and positive factor which estimating a higher coefficient of elasticity in Maha Season than Yala season. This indicated that, land is the most important factor regarding that season. According to them, it causes to increase the paddy output by 87% when it doubles the land extent keeping other variables constant. Not only Maha season, in the Yala season, land was positively related to the paddy yield. However, during Maha season, labor coefficient was not significant but in Yala season it was the opposite of the Maha season. Even though in Yala season, labor was a significant variable, it was unable to increase the production by increasing labor more and more. Anyway, the elasticity of labor was higher than the elasticity of land. Furthermore, the study implied that the opposite results under Yala season was recorded due to shortage of water. Regarding agrochemical, the coefficient was insignificant indicating a small increase in paddy production when that input is increased. When considering the empirical studies, land, labor, fertilizer usage and agrochemicals were taken into account as the most important factors for deriving paddy production function with reference to past researchers' views. In addition, some researchers have used socio economic factors such age, gender, education level etc. As well as the empirical evidences showed differences among regional and seasonal aspects of the cultivation. Furthermore, those studies explored many facts and information about the fertilizer subsidy scheme with some consequences and inefficiencies. Also, there is a criticism that, though the fertilizer subsidy is more politically and socially acceptable, no much evidences to prove that it is economically efficient.This brief empirical literature examined that there are various experience of fertilizer usage on agricultural product; especially in paddy farming sector not only in global context, but also within the Sri Lankan context. However, it can be concluded that fertilizer subsidy has become a most significant and popular research area regarding agricultural perspectives.

III. METHODOLOGY

The main objective of the study is to explore the microeconomic impact of Fertilizer Subsidy in Sri Lankan context. For that, the study considersthe impact of fertilizer usage on average paddy yield based on the reviewed literature as hypothesized above literature part.Consideringpast literature, the study uses following variables as follows.

Figure 1: Conceptual Framework



Source: Survey Data by Author (2020)

Organization of variables

Independent variables- Labor hours, Capital (Land and Fertilizer) * natural log values of all variables
Dependent variable- Average Paddy Yield

Study Area

Udawalawe irrigation system is one of the major development projects which implemented by the government of Sri Lanka under the Mahaweli Development project. It was formed using the Walawe river including 1200 area of square kilometers. This project was implemented during 1963-1967 in order to develop irrigated infrastructure around 32000 hectares. It consists with two main canals; Right Bank Main Canal and Left Bank Main Canal. Those canals include seven blocks namely; Chandrikawewa, Murawesihena, Angunukolapelessa, Kiribbanwewa, Sooriyawewa, Mayurapura and Thissapura. Paddy is the main cultivation of Udawalawe scheme which accounted the highest Average Yield 6355 (Kg/ ha), (Department of Census and Statistics, 2017/2018 Maha season) over the other Schemes of Mahaweli Development Project. Udawalawe irrigation system is the only project which located in Southern of Sri Lanka. Therefore, it is very important to study the micro level impact on paddy cultivation from this zone. Not only that, this zone contributes to the total

paddy cultivation yielding the highest production than any zone which located in Mahaweli Development areas. Therefore, the significance of this zone is very essential to study the current situation and impact of fertilizer subsidy on paddy cultivation in Sri Lanka.

Population

Since the Udawalawe Irrigation System is the highest paddy yielding scheme under Mahaweli Development areas, it gives a higher importance to this topic selecting Udawalawe scheme as the study area. It includes seven blocks as mentioned above. From these seven blocks, Murawesihena block is special from other blocks hence it includes 6565 acres of net extend harvested which accounted for more than 27% of total area under Udawalawe scheme. The population is 5166 paddy farmers in Murawesihena block.

Sample

The population (5166) can be divided under 33 GramaNiladhari Divisions. Five GramaNiladhari Divisions were selected randomly as the sampling frame and then, 150 paddy farmers of five villages from each GramaNiladhari Divisions were selected randomly as the sample using Cluster Sampling Method.

Data Collection

To gather cross sectional data (primary data), a questionnaire was distributed among 150 paddy farmers in five villages in Murawesihena block as a proportionate to the number of families in five villages. Questionnaire survey was developed to collect data initially aiming 150 farmers. Due to the incomplete data, only 110 questionnaires were accepted and others were rejected from the sample. The questionnaire was formulated to gather all the quantitative data such as usage of fertilizer subsidy, land and labor hours. Thequestionnaire was consisted with 15 questions included both open ended and close ended questions. The survey was conducted by myself visiting farmers and the additional comments and information which received by farmers were purely noted down for the study.

Method of Analyzing

Production function method was used as the main tool based on Cobb-Douglas production function. Bhavan &Maheshwarathan in 2012 analyzed a tobit regression to determine the efficiency of the farmers. The study used Cobb-Douglas production function and land, labor, fertilizer and pesticides and paddy production were the variables used in the model. This study has adopted a quantitative approach where multiple regression model and Cobb-Douglas Production Function were used to determine the impact of fertilizer usage on average paddy yield.In order to estimate the micro level impact, here also the Cobb Douglas production function was used (Wanninayaka, 2012, Bhavan&Maheshwarathan, 2012).

$Y= \beta 0 + X1^{\beta 1} + X2^{\beta 2}+ui$

$Ln\ Yi= \beta 0+ \beta 1\ ln\ X1+ \beta 2\ ln\ X2+ui$

Where,

LnYi=log value of paddy yield

LnX1=log values of labor

LnX2=log values of Capital (Land and Fertilizer)

β0 β1 β2 are parameters

In order to identify the specifications of Cobb- Douglas Production Function, some of the features are tested. As well as it was measured the impact of fertilizer usage on average paddy yield at micro level. Significance was tested under 5 per cent level of significance, testing the hypothesis that, there is a positive relationship between fertilizer usage under subsidy scheme and average paddy yield.Several econometric tools were applied to estimate the regression function in order to analyze the impact of fertilizer subsidy scheme such as Unit Root Test, Normality Test, Multicollinearity and Homoscedasticity using EViews 8 Statistical package.

IV. DATA ANALYSIS

This chapter is designed to represent how the main objective of the study is achieved by representing primary data. It has used two analysis such as multiple regression analysis and Cobb-Douglas Production Function Analysis.

Multiple Regression Analysis

In this analysis, Log values of Average Paddy yield (kg per acre) was taken as the dependent Variable and Usage of Fertilizer (Dummy Variable-If adequate-1, otherwise-0), Log values of Land (acres) and Log values of Labor (Hours) were taken as Independent Variables.According to the VIF values and Tolerance values, it can be stated that the model is free from multicollinearity issue hence VIF values are less than 10 and TOL values are greater than 0.2.

Table 1: VIF and TOL values of variables

Variable	VIF	TOL (1/VIF)
LAND__ACRES	1.839281	0.5436
LABOUR_HRS	1.859126	0.5378

FERTI_KG	1.014986	0.9852

Source: Survey Data by Author (2020)

According to the normality test, JB statistics is closer to zero (0.08) and probability value is higher than the 5%. (0.959). Therefore, the residuals are normally distributed.The result indicated that the probability value of chi square is 0.4472 means that it is not significant because p value is higher than 5%. Hence the results indicated that the absence of heteroskedasticity.

Table 2: Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.875415	Prob. F (3,106)	0.4564
Obs*R-squared	2.659457	Prob. Chi-Square (3)	0.4472
Scaled explained SS	9.191798	Prob. Chi-Square (3)	0.0268

Source: Survey Data by Author (2020)

Model specification

According to the Ramsey RESET Test results, F statistics value is 0.14 and the probability value is 0.70. It means that p value is greater than 5% indicating that the model is correctly specified.

Table 3: Ramsey RESET Test

Ramsey RESET Test				
	Value	df	Probability	
t-statistic	0.376199	105	0.7075	
F-statistic	0.141526	(1, 105)	0.7075	
Likelihood ratio	0.148165	1	0.7003	

Source: Survey Data by Author (2020)

Model for Regression

In order to identify the impact of fertilizer usage on average paddy yield, the multiple regression analysis was conducted and based on that, following results were obtained.

Table 4: Regression Model

Dependent Variable: YIELD__KG_				
Included observations: 110				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LAND__ACRES_	0.971944	0.040638	23.91696	0.0000
LABOUR_HRS	-0.026679	0.057904	-0.460748	0.6459
FERTI_KG_	0.104684	0.045760	2.287678	0.0241
C	7.865981	0.314079	25.04463	0.0000
R-squared	0.906352	Mean dependent var		8.551389
Adjusted R-squared	0.903701	S.D. dependent var		0.580291
S.E. of regression	0.180076	Akaike info criterion		-0.555189
Sum squared resid	3.437304	Schwarz criterion		-0.456989
Log likelihood	34.53538	Hannan-Quinn criter.		-0.515359
F-statistic	341.9648	Durbin-Watson stat		2.308909
Prob(F-statistic)	0.000000			

Source: Survey Data by Author (2020)

Equation,

YIELD__KG_ = 7.86 + 0.97* LAND__ACRES – 0.02* LABOUR_HRS + 0.10* FERTI_KG

According to the above equation,β0= 7.86 means that, when other variables remain constant, if the provided fertilizer subsidy is not adequate, the average yield will be increased by 7.86 percent.β1= 0.97, if other variables are keeping constant with respect to the inadequate fertilizer usage, when land acres increased by 1 percent, the average yield will be increased by 0.97 percent.β2= -0.02, if other variables held constant with respect to the inadequate fertilizer usage, when labor hours increases by 1 percent, the average yield will be decreased by 0.02 percent.β3= 0.10, if other variables hold constant with respect to the inadequate fertilizer usage, when adequate fertilizer usage increases by 1 percent, the average yield will be decreased by 0.10 percent.According to the analysis, land and fertilizer usage have significant positive relationship indicating p value which is less than 0.05. As well as land is the most important factor regarding this analysis which contributing a higher amount of percentage (0.97 percent). However, labor is not a significant factor which amounting 0.64 of p value which is higher than 5% in the study. Considering the model, R squared value is 0.90 means that the 90 percent of the variation in dependent variable of the model is explained by the explanatory variables indicating a better fitness of the model.The calculated F value is 341.96 and the table value of F is 2.35. According to that, it can be concluded that overall model is jointly or simultaneously significant. In here, calculated F value is higher than the F table value.The results indicated that the importance of land and less contribution of fertilizer usage on paddy yield. This reveals that a requirement of efficient subsidy schemes for micro level farmers with a better contribution to increase paddy production.

Cobb-Douglas Production Function Analysis

Cobb-Douglas production function is one of the most important functions that can be used to analyze the data. In this study, it uses the Cobb- Douglas production Function in order to analyze the impact of labor and capital variables and to find out whether the micro level paddy farming sector should be capital intensive or, it should be labor intensive. Fertilizer has included in the capital with land. Summation of log values of fertilizer and landforms the capital.According to the analysis, Log values of Average Paddy Yield was taken as the dependent variable and Log values of Labor hours, Log values of Capital were taken as the independent variables.

Table:5 VIF and TOL values

Variable	VIF	TOL (1/VIF)
LABOUR_HRS	1.407262	0.710
CAPITAL	1.407262	0.710

Source: Survey Data by Author (2020)

According to the VIF values and Tolerance values it can be stated that the model is free from multicollinearity issue hence VIF values are less than 10 and TOL values are greater than 0.2.According to the Ramsey RESET Test, F statistics is 0.337 and the probability value of F statistics is 0.56 indicating the best fitted model.

Table 6: Ramsey RESET Test

	Value	df	Probability	
t-statistic	0.581133	106	0.5624	
F-statistic	0.337716	(1, 106)	0.5624	
Likelihood ratio	0.349903	1	0.5542	

Source: Survey Data by Author (2020)

It was obtained following regression model for the Cobb- Douglas Production function as follows,

Table 7: Model for Cobb-Douglas Analysis

Dependent Variable: YIELD__KG_				
Included observations: 110				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LABOUR_HRS	0.231143	0.087079	2.654400	0.0092
CAPITAL	0.404295	0.029797	13.56832	0.0000
C	4.510267	0.432334	10.43236	0.0000

R-squared	0.751465	Mean dependent var	8.551389
Adjusted R-squared	0.746819	S.D. dependent var	0.580291
S.E. of regression	0.291985	Akaike info criterion	0.402667
Sum squared resid	9.122327	Schwarz criterion	0.476317
Log likelihood	-19.14669	Hannan-Quinn criter.	0.432540
F-statistic	161.7614	Durbin-Watson stat	2.455536
Prob(F-statistic)	0.000000		

Source: Survey Data by Author (2020)

YIELD__KG_ = 4.51+0.23*LABOUR_HRS + 0.40*CAPITAL

β0= 4.51, when labor and capital remain constant, on average, the average yield is increased by 4.51 percent.β1= 0.23 is the elasticity of average paddy yield, with respect to the labor input. That is, it measures the percentage change in average paddy yield for 1 percent change in labor hours holding capital input constant. According to that, average paddy is increased by 0.23 percent when labor input increased by 1 percent holding capital input constant.β2= 0.40 is the elasticity of average paddy yield, with respect to the capital input. That is, it measures the percentage change in average paddy yield for 1 percent change in capital inputs holding labor input constant. According to that, average paddy is increased by 0.40 percent when capital input increased by 1 percent holding labor input constant.According to the obtained results, it can be concluded that, capital is the most crucial factor regarding the analysis. Therefore, this implies the capital intensive of the production function.β1+ β2= 0.23+0.40 = 0.63, means that, this occurs decreasing return to scale. It means, when, doubling the inputs will less than double the output (average paddy yield).In the study, all the variables have a significant positive relationship indicating all probability values which are less than 5%.As well as 75% of the total variation in the dependent variable is explained by the labor and capital inputs indicating a better fitted model.The calculated F value is 161.76 and the table value of F is 2.35. According to that, it can be concluded that overall model is jointly or simultaneously significant. In here, calculated F value is higher than the F table value.

By reviewing current study and past studies, it states the importance of existence of a well-organized fertilizer subsidy scheme for paddy cultivation in Sri Lankan context. Therefore, it is a requirement to make the efficiency of paddy farming sector in micro level in order to prevent from stagnation of rural farming sector. Considering both models in this study, it can be concluded that the formulated hypothesis,

H1: Fertilizer usage has a positive relationship with average paddy yield

Can be accepted with the estimated results.

Considering the past researches, they have also examined the similar results regarding the study. According to Mulyadiana, Marwanti&Rahaya (2018), the results indicated that land, use of fertilizer usage, effectiveness of fertilizer subsidy have a significant positive relationship with the yield of paddy while, labor and use of seed have no significant impact on paddy production. Wanninayake&Semasinghe (2012) conducted a study with the objective to examine the effectiveness of fertilizer subsidy on paddy production. They have revealed that, the relationship between average yield of paddy and fertilizer subsidy is a statistically positive and significant. In this study also, it reviews that, fertilizer subsidy is an important factor in microeconomic context in Sri Lanka emphasizing the importance of capital-intensive paddy farming in micro level aspect.

V. CONCLUSION, RECOMMENDATION AND POLICY IMPLICATION

With the analysis of results, it can be concluded that, the fertilizer subsidy plays a major role in Sri Lankan rural paddy farming sector regarding microeconomic aspect. Especially, rice is the staple food in Sri Lanka, the involvement for the paddy cultivation highlyaffected by the fertilizer subsidy. Providing subsidy is a major requirement for the paddy sector in order to increase the production of paddy. But the contribution to the average yield is lower considering the study area.

As a developing nation, agriculture sector could be seen as an important aspect which yield a higher contribution to the GPP. In the world, most of the countries have achieved their structural change from agriculture sector to industrial sector only after achieving the success of agriculture sector. Therefore, in Sri Lankan context, it should be encouraged the paddy sector by providing various type of fertilizer subsidy schemes for the sake of agricultural sustainability. Moderation of fertilizer subsidy is essential for the microaspect in order to overcome the issues regarding this context.

In order to increase the paddy yield in Sri Lanka, some of the policy implications which could be adopted in micro level paddy sector such as, Moderation of the fertilizer subsidy scheme in order to have real efficiency in micro level farming activities; Implementing institutional framework towards the organic fertilizer subsidy scheme rather than chemical fertilizer subsidy; Introducing all farmers inclusive financial and technical guiding system with the assistance of Mahaweli Block Managing Offices; Implementing Reviewing progress committee for the paddy sector at micro level paddy farming activities under Block Managing Offices.

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