The Impact of Cost of Paddy Production on Farmers' Standard of Living: A Case Study to Maritimpattu Divisional Secretariat in Mullaitivu District

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Introduction

Paddy production has become a main source of standard of living for farmers in Sri Lanka not only by providing them with basic food requirement but also generating income and increasing the number of jobs to rural communities. Demand for paddy production is steadily increasing day by day in all over the world due to rise in population. In this regard, demand for paddy in Sri Lanka increase at rate of 1.1 % per year. To meet this, the rice production should grow at the rate of 2.9 % per year (Department of Agriculture, 2014). However, the increases of cost of production, climate changes, inadequate market opportunities and etc. tend to leads for stagnated yield which has made paddy farming a non-viable enterprise during the last few decades. For example, cost of labor, farm power cost and tradable inputs constitutes 5 5 %, 23 % and 2 3 % respectively in total cost of paddy (Department of Agriculture, 2015). Even though Sri Lanka achieved self-sufficiency in paddy production, due to above reasons the farmers are unable to earn profit from their paddy business. Thus, several farmers leave from farming due to inadequate and/ or uncertainty of income.

The majority of the rural people, i.e. more than 61 %, in Mullaitivu District depend on agriculture as their main source of income (Department of Agriculture in Mullaitivu, 2015). At the same time poverty level of this district was 28.8 % (Central Bank of Sri Lanka, 2015), Since Mullaitivu District was harshly affected by war for a long

period, large amount of lands are not in use due to security reasons yet, high cost of production and lower prices of their product tend to leads to the extreme poverty and low living standard among the farmers. At the same time, society also has faced socio-economic problems. Such situation arises due to lack of research and less attention by government policy makers on this area. Although there are several researches which focus on the economic impact of cost of paddy production on the living standard of farmers (Rahman et al., 2005; Rabu et al., 2013) in the world, Mullaitivu district is not yet adequately explored.

Objectives

The primary objective of this study is to examine the impact of cost of paddy production on the living standard of farmers' of Mullaitivu district. The specific objectives are: (i) To diagnose the main socio-economic factors affecting the cost of paddy cultivation, (ii) To identify and analyze the factors which influence on paddy production (iii) To examine the factors that affecting the income of farmers.

Methodology

This study mainly use primary and secondary data also employed where it necessary. The primary data was collected using percentage random sampling method by issuing the questionnaire for 60 families of study area in two round survey (2012 and 2015). The study area of Martimapattu DS division was selected based on purposive random sampling method. The secondary data were collected from the reports of relevant department. Following the Neo Classical growth theory, we used Fixed Effect Multiple Linear Regression Model (FEMLRM) to identify the determinants of cost of paddy production and farmers' income, which are given by equation (1) and (2) respectively.

$$\ln TC_{it} = \propto_{\circ} + \sum_{j=1}^{7} \alpha_j \ln X_{it} + \delta_1 \ln Y_{it} + \delta_2 \ln FS_{it} + \delta_3 \ln EDU_{it} + \delta_4 \ln EXP_{it} + \delta_5 \ln AG_{it} + \delta_6 \ln HHS_{it} + \delta_7 D_1 + \delta_8 D_2 + \delta_9 D_3 + \delta_9 D_4 + \mu_i + \varepsilon_{it} \quad (1)$$

$$\ln Q_{it} = \alpha_0 + \alpha_1 \ln KC_{it} + \alpha_2 \ln LC_{it} + \alpha_3 INPC_{it} + \alpha_4 \ln TRC_{it} + \alpha_5 \ln FS_{it} + \alpha_6 D_3 + \mu_i + U_{it} \quad (2)$$

Thirdly, we adopted Cobb-Douglas production function to examine the factors that affect the paddy production, which is given by:

$$\begin{aligned}\ln TINC_{it} = {} & \beta_0 + \beta_1 \ln TC_{it} + \beta_2 \ln Y_{it} + \beta_3 \ln FS_{it} + \beta_4 \ln EDU_{it} + \\ & \beta_5 \ln EXP_{it} + \beta_6 \ln NY_{it} + \beta_7 \ln SAV_{it} + \beta_8 \ln LOAN_{it} + \beta_9 D_1 + \\ & \beta_{10} D_2 + \beta_{11} D_3 + \beta_{12} D_4 + \mu_i + \varepsilon_{it} \end{aligned} \quad (3)$$

where, TC: average production cost, Q: average paddy production, TINC: total income of farmers, $X = [KC, LC, SC, FC, WC, PDC, TRC]$ KC: capital cost, LC: labour cost, SC: seed cost, PDC: pesticides cost, WC: weed cost, FC: fertilizers cost, EDU: education level of the farmers, HHS: household size, Y: monthly average income from farm, FS: farm size, EXP: experience of the farmer, NY: monthly average income from non-farm, AG: age of farmers, TRC: transport cost, INPC: inputs cost, SAV: saving, D_1: land ownership, D_2: agriculture training D_3: irrigation system, D_4 : quality of land and μ_i: individual specific fixed effect, u_{it} and ε_{it}: error terms $(0, \sigma^2)$.

Finally, we utilized Logit model to investigate the living standard of farmers, which is takes the form as:

$$\begin{aligned} LS_{it} = {} & \rho_0 + \rho_1 TC_{it} + \rho_2 Q_{it} + \rho_3 \ln Y_{it} + \rho_4 \ln NY_{it} + \rho_5 SAV_{it} + \rho_6 HHS_{it} + \\ & \mu_i + \vartheta_{it} \end{aligned} \quad (4)$$

where, LS is the standard of living of farmers which takes value 1, if the household *i* is the standard of living, is above average level, 0 otherwise; NY: non-farm income, SAV: saving. μ_i is the individual specific fixed effect and ϑ_{it} is the white noise error term. We also used Weighted Least Squared (WLS) Method to compare the results of FEMLRM.

Results and Discussion

Hausman test suggests that fixed effect model is appropriate to this study. The Table 1 below presents the estimated results of cost of paddy production.

Table 1: Cost of Paddy Production Estimates by Fixed Effect

Variables	Coef.	Std. Err	T	P>|t|
lnkc	0.4948	0.0119	41.4	0.000***
lnlc	0.3365	0.0084	39.6	0.000***
lnsc	0.0663	0.0139	4.75	0.000***
lnfc	0.0289	0.0074	3.91	0.000***
lnwc	0.0291	0.0041	7.08	0.000***
lnpdc	0.0489	0.0048	10.0	0.000***
lntrc	-0.0038	0.0041	-0.91	0.363
lny	-0.0048	0.0039	-1.24	0.218
lnfs	0.0031	0.0033	0.94	0.350
lnedu	0.0043	0.0048	0.91	0.365
lnexp	0.0025	0.0017	1.43	0.157
lnag	-0.0044	0.0056	-0.78	0.439
lnhhs	0.0018	0.0033	0.54	0.592
d1	0.0015	0.0027	0.57	0.567
d2	0.0016	0.0023	0.70	0.484
d3	-0.0048	0.0025	-1.87	0.064*
d4	0.0020	0.0034	0.60	0.552
c	1.2780	0.1587	8.05	0.000

Note: *, **, *** represents the 10 %, 5 % and 1 % level of significant respectively.

The above table reveals that as expected to the theory and some of the existing literature (Egbodian and Ahmadu, 2015; Ahmad and Razmy, 2005; Aheer et al., 2005), cost of capital, labour and total input cost (SC, FC, WC, PDC and TRC) have significant and positive impact on cost of paddy production. Further, method of irrigation negatively affects cost of paddy production at 10 % significant level. The estimated result of production function is given by Table 2.

The results in Table 2 indicate that the cost of capital and cost of transportation, farm size and irrigation method have significant and positive impact on quantity of paddy production. This findings is similar to some of the existing empirical findings (e.g., Aung, 2012; Egbodin and Ahmadu, 2015; Gamawelagedara et al., 2011).

Table 2: Paddy Production Estimates by Fixed Effect

Variables	Coef	Std.err	T	P>|t|
lnkc	0.3665	0.1843	1.99	0.049**
lnlc	-0.0245	0.1251	-0.20	0.845
lninpc	-0.0389	0.1339	-0.29	0.772
lntrc	0.1307	0.0576	2.27	0.025**
lnfs	0.8513	0.03866	22.0	0.000***
d3	0.0734	0.0365	2.01	0.047**
cons	3.9543	2.3147	1.71	0.090

Note: *, **, *** represents the 10 %, 5 % and 1 % level of Significant respectively

The Fixed effect income estimates in Table 3 reveal that as expected farm income, non-farm income, saving and irrigation system affect the farmers total income positively at 5 % significant level, while cost of paddy production affect and negatively at 10 % level of significant. Moreover, irrigation system has positive and significant impact on total income of farmers.

Table 3: Income Estimates by Fixed Effect

Variable	Coef.	Std. Err.	t	P>|t|
lnq	0.04574	0.03951	1.16	0.251
lntc	-0.32563	0.17154	-1.90	0.062*
lny	0.45459	0.04120	11.0	0.000***
lnny	0.41265	0.02022	20.4	0.000***
lnedu	-0.02923	0.04131	-0.71	0.481
lnsav	0.07126	0.02149	3.32	0.001***
d1	0.00021	0.03104	0.01	0.995
d2	-0.01762	0.02225	-0.79	0.431
d3	0.05845	0.02389	2.45	0.017**
d4	-0.03946	0.03917	-1.01	0.317
cons	4.48959	1.73822	2.58	0.012

Note: *, **, *** represents the 10 %, 5 % and 1 % level of Significant respectively

The WLS method also reveals the same results as FEMLRM (results are not presented here but available up on request).

The Logit regression results in Table 4 imply that several variables are significantly correlated to the living standard of farmers. First, negative coefficient estimate of LNTC indicates that an increase in total cost of farmers decreases the probability of the farmers being above the average living standard level. Second, an increase in monthly average income of farm increases the probability of the farmers being above the average living standard level as coefficient of LNY variable is statistically significant and positive. This finding is similar to some of the existing empirical findings (Abur, 2014; Labbe, 2014; Makki et al., 2013). Third, a rise in non-farm income appears to increase the probability of the farmers being above the average living standard level. Finally, an increase in saving raises the probability of the farmers being above the average living standard level as coefficient of LNSAV variable is statistically significant and positive. The odd ratio also suggests the same conclusion as the value of odd ratio of LNTC is less than 1 and LNY, LNNY and LNSAV are greater than 1.

Table 4: Logit Estimation of Farmers Living Standard Model

Variables	Coef.	dy/dx	odds ratio	Average
lntc	-9.3414 (0.039**)	-0.09819	0.00008	10.58
lnq	1.8179 (0.274)	0.01911	6.15936	9.760
lny	5.0443 (0.005**)	0.05302	155.138	8.934
lnny	2.7360 (0.014**)	0.02876	15.4253	9.202
lnsav	2.6901 (0.047**)	0.02827	14.7338	7.290
lnhhs	-4.3139 (0.100)	-0.04534	0.01338	1.378
cons	1.7703 (0.962)		5.87361	

Note: *, **, *** represents the 10 %, 5 % and 1 % level of significant respectively. probability values are given in the parenthesis

Conclusion and Policy Implications

The results of FEMLRM reveal that capital, labour and total input costs have significant and positive impact on cost of paddy production. Further, cost of capital, transportation cost and farm size are positively linked with quantity of paddy production. Moreover, total cost is negatively correlated with farmer's total income while farm income, non-farm income and saving have positive impact on monthly average total income of farmers. Logit model suggest that raises in cost of paddy production decreases the probability of farmers being above the average level of living standard, whereas farm income, non-farm income and saving have a positive impact on it. Therefore, the government should take necessary actions to reduce the cost of paddy production in order to increase the living standard of farmers.

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