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Factors Affecting Farmers` Higher Gain from Paddy Marketing: A Case Study on Paddy Farmers in North Central Province, Sri Lanka

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Abstract

This study focused to identify the likelihood factors affecting on farmers' higher gain from paddy marketing in the North Central Province of Sri Lanka, where the main paddy cultivation area of the country. The required data was drawn from the field survey carried out in three irrigation systems covering 257 farmers during July to August 2010. The empirical logit model was used to assess factors. The study found that imperfections of existing paddy marketing system in the area due to concentrated market power among few oligopolistic buyers. Furthermore, land size, land ownership, poor accessibility in formal sector credit market and farmers involvement in informal sector credit sources are critical to farmers' decisions to gain higher returns from paddy marketing. The results further showed the need of reviewing the roles and functions of government extension services and farmer organizations with regard to the paddy marketing.

Keywords:
Paddy Farming, Small Scale Farmer, Paddy Marketing System, Price returns, Empirical Logit Model

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INTRODUCTION

As rice is the staple food of Sri Lanka and provides about half of daily calorie requirement (World Bank, 2010; Department of Agriculture, 2010), every successful government has given the first priority for self sufficiency in paddy in terms of food security at the national level. At present paddy occupies the largest extent of the cultivated area of the domestic agriculture (see Appendix 1). The total gross extent of the fields sown with paddy in 2009 is about 991,000 ha while 646,000 ha and 345,000 ha were sown in both Yala and Maha seasons, accomplishing a high self sufficiency ratio (see Appendix 2). About 45% of total permanent agricultural land is utilized for paddy cultivation and majority of the farmers (70%) are small land holders cultivating less than 1 ha (Wijetunga *et al.*, 2008). Moreover, in the year 2009, this sector accounts for nearly 2.6% of the GDP (Central Bank of Sri Lanka, 2009). In spite of given importance, at present, the sector is facing an unparalleled crisis which is rapidly pushing the sector towards more vulnerability. As cited by many studies, one of the core issues is that the slimming down of the net returns of paddy farming due to discriminatory price offered to the paddy producers at the paddy market (Gunawardene and Somarathna, 2001; Epaarachchi *et al.*, 2002; Prasanna, 2007).

The existing knowledge in the field shows that the net income of paddy farmers has declined significantly causing the continuous deterioration of welfare of farmers, particularly the small scale farmers (Adhikarinayaka, 2005, Prasanna, 2007). This has led some farmers to move away from paddy farming (Wijetunga *et al*., 2008). As studied by Prasanna (2007), the real income of paddy farming per hectare has declined by 37.4% in the North Central Province during 1990 to 2005. Even though paddy productivity is high in the dry zone, high cost of production and unreasonable prices have narrowed farmers` profit margin and rendered paddy cultivation unprofitable (Irshad and Thiruchelvam, 2006). During last few decades, the cost of paddy cultivation has increased significantly (see table 1). For instance, the nominal cost of cultivating one acre of paddy in Maha season was Rs, 31,125 in 2005 and it has increased to Rs, 36,909 by 2009. It shows an increase of nominal value by 18.6% during last five years.

However, the government intervention in the development paddy sector through demand and supply oriented measures were seen in last few decades. In the demand side, the marketing intervention were mainly taken place, but the ineffectiveness of the policy is seen due to number of factors such as lack of bargaining power in the paddy market due to less market share of the government, concentrated market power among a group of oligopolistic buyers, indebtedness of the farmers to the local traders for fertilizer, pesticides and tractors, seasonality of the agricultural products, low technical skills and weak extension services from relevant authorities and limited access to the agricultural credit, etc (see Ap-

Table 1: Cost of Paddy Cultivation (Per acre) 2005 and 2009 Maha Season

Item	2005				2009			
	Labour cost	Machinery cost	Input cost	Total cost	Labour cost	Machinery cost	Input cost	Total cost
Land preparation	3000	4500		7500	3600	5250		8850
Sowing	2000		1860	3860	2400		2184	4584
Fertilizer application	500		1365	1865	600		1365	1965
Control of pest and weed	500	300	2100	2900	600	300	2935	3835
Irrigation	2000			2000	2400			2400
Harvesting	5000			5000	6000			6000
Threshing and winnowing	1000	2900		3900	1200	3250		4450
Transport	1000	500		1500	1200	500		1700
Other			2600	2600			3125	3125
Total	15000	8200	7925	31125	18000	9300	9609	36909

Source: Department of Agriculture, Sri Lanka

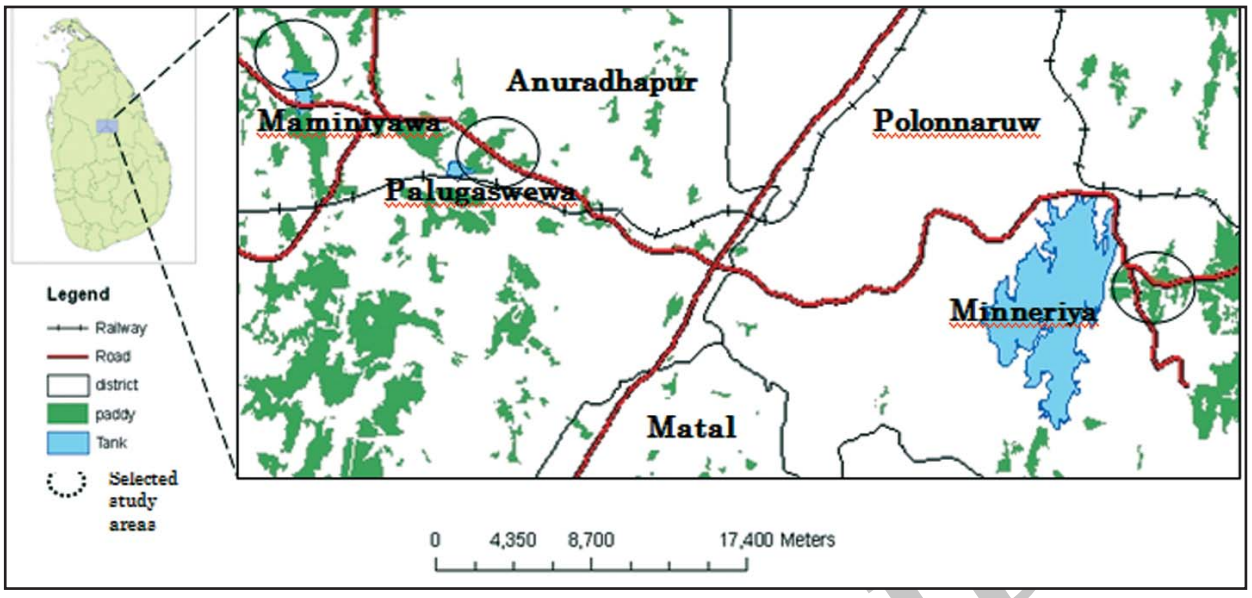

Figure 1: Location of selected irrigation systems, farm villages, and paddy fields in survey area
Source: Field survey, 2010

pendix 3). In the supply side, the fertilizer subsidy is the main policy. It has become a heavy financial burden on the government budget with escalation of fertilizer prices at the world market causing series of unsolicited macroeconomic implications (Rajapaksa and Karunagoda, 2008; Rafeek and Samaratunga, 2000). However, many scholars argue that the fertilizer subsidy should gradually be withdrawn with better marketing mechanism as it is one of the key determinants of paddy production (Wijetunga *et al*., 2008; Rajapaksha and Karunagoda, 2008). Although many studies have cited the poor returns of paddy farming mainly due to marketing issue and emphasized the need of better marketing practices for paddy farmers, there are no enough theoretical and empirical studies that have been undertaken to analyze the issue in farmers' instance. In this background, in order to contribute to the existing knowledge in the field, the main focus of the study is to assess the factors affecting the farmers' decision to gain higher returns from paddy marketing. In this connection, this study will examine the following points: 1), the existing paddy marketing system in the survey area, 2), the characteristics of the paddy farmers and 3), factors effect on farmers` decision on higher price returns from the paddy marketing.

MATERIALS AND METHODS

Study area

The Polonnaruwa and Anuradhapura districts, which are located in the North Central Province and dry zone of Sri Lanka, were selected for the field survey as selected two districts are well-known for the paddy cultivation and many marketing participants are involving in the paddy marketing channel (see figure 1). The province covered 10714 which are 16.31% of total country's land. More than 65% of the people in the province is dependent on agriculture and agriculture related industries. Paddy cultivation in the area is under three different irrigation systems: major, minor and rain-fed irrigation systems. The total gross extent of fields sown with paddy is about 408,178 acres while 115,297 acres and 292,881 acres were shown in both Yala and Maha seasons, respectively. 67% of cultivated area is represented irrigated system and 29.3% and 2.87% are represented rain-fed irrigation systems, respectively. A majority of the farmers are smallholders with land of area less than a hectare.

Sampling strategy and data collection in the field

In order to deal with the research subject, the empirical approach was used based on quantitative and qualitative analysis of the survey data. The study was mainly based on primary data,

which were drawn from a field survey. The survey was carried out covering three agricultural schemes: major, minor and rain-fed irrigation schemes located in Anuradhapura and Polonnaruwa districts of North Central Province, administering a structured questionnaire to farmers during July to August 2010. The GN division, which is the bottoms administrative unit of the country, was selected as a sampling unit and 98, 81, and 78 farm households from Akkara 70, Maminiyawa, and Palugaswewa GN divisions were randomly selected by using stratified random sampling technique for the survey, respectively. Moreover, the participants in the paddy supply chain such as village level independent assembles, mill owners (processors), retailers, local wholesalers, large scale traders and government agricultural officers were interviewed in order to elicit the data of paddy marketing in the area.

Econometric methodology

In order to identify the factors affecting farmers' selling decisions to gain the returns from the paddy marketing, logit model was used as it is popular in regressions involving a dichotomous dependent variable and uses to estimate the conditional probability that a particular event is present. It directly provides the interpretation in terms of logarithm of the odds in favor of success (Collett, 1991). The study considers the factors that influence the farmers' selling decision to gain the returns from the paddy marketing. The farmer either gains a higher return from the paddy marketing (Y=1) or does not gain a higher return from the paddy marketing (Y= 0). The farmers in each system were divided into these two groups based on the mean price levels in the studied season as it is much closure to guaranteed price, which is recognized as a fair price, established by the government (see table 2). The variables in the empirical logit model were selected based on the existing knowledge in the field. We specify the model for the probability of a positive response and probability of a negative response by equation (1) and (2), respectively.

$$Pi\ (Yi = 1) = 1/(1+ e^{-z_i}) \quad (1)$$

$$Pi\ (Yi = 0) = 1\text{-}1/(1+ e^{-z_i}) \quad (2)$$

Where, $Z_i=\beta_1+\beta_2 X_i... ...\beta_k X_k$. The logit model, which gives the odd ratio in favor of a farmer gaining a higher return, is derived as follows and binary choice models are usually estimated using the method of maximum likelihood (MLE).

$$P_i/1\text{-}P_i= 1+e^{z}i/1+e^{-zi} \quad (3)$$

To estimate the model, we transformed the equation into log form. The log likelihood function of equation (3) is,

$$Ln(P_i/1\text{-}P_i)=Z_i=\beta_1+\beta_2 X_i... ...\beta_k X_k \quad (4)$$

The equation (4) can be written as,

$$L_i=ln\ (P_i/1\text{-}P_i)= \beta_1+\beta_2 X_i... ...\beta_k X_k \quad (5)$$

Where, L_i is the logit function. Therefore, using an equation (5) as the basic specification, the empirical model for the study on factors that influence the farmers' selling decisions to gain the returns at the paddy market is:

$$L_i=ln\ (P_i/1\text{-}P_i)= \beta_1+\beta_2 X_i... ...\beta_k X_k + u_i \quad (6)$$

The slope coefficient, $\beta_{2, (...\beta k)}$ given in equation (6) measures the change in logit (log-odds) for a unit change in regressor, Xi, (…Xk), holding all other variables constant (Gujarati, 2003). After estimation of equation (6), elasticity at the mean of each independent variable was derived because estimated coefficients do not have a direct economic interpretation and elasticity provides interesting guidance for policy implications. STATA and SPSS statistical softwares were used to analyse the survey data.

As we discussed at the beginning of econometric methodology, we need to determine the "reference price" level from the data set in order to identify both farmer group. In determination of reference price levels for each irrigation scheme, by considering three important statistics (mean, median and mode), mean values of the price variables were taken into account in order to derive efficient number spanning the price levels reached by farmers in three irrigations systems. Table 2 shows the number of famers below and above the reference price levels in each selected

Table 2: Representation of farmers based on reference price level

Type of irrigation Scheme	Reference level	No of farmers
Major irrigation system	Below Rs. 28.32	50
	Above Rs. 28.32	48
Minor irrigation system	Below Rs. 27.98	42
	Above Rs. 27.98	39
Rain-fed system	Below Rs. 27.34	46
	Above Rs. 27.34	32

irrigation system. The established reference price levels for each system is related with the marketing since it is much closure to the guaranteed price which is based on the cost of production of the season and established by the government. In the studied period, guaranteed price for paddy was Rs, 28.00 (Department of Agriculture, 2010).

Based on existing theories and previous studies, we defined the explanatory variables for the empirical model (see table 3). EDUC refers to educational level of farmer, which is an indicator of human capital and it was explained using the code assigned for each educational level: non schooling -1, until grade 5 - 2, grade 5 to O/L - 3, A/L – 4 and graduate level - 5. It was hypothetically expected the positive relationship between educational level and dependent variable. HHSIZE is household size. In paddy farming, a family labour plays significant role, particularly in the period of harvesting, storing, packaging, etc. which are pre-stage of the paddy marketing. EXPF measures number of years of farmers` experience in the paddy farming and it is theoretically expected a positive relationship between experience in the paddy farming and dependent variable. The variable MEMFO, which is a dummy variable, refers the membership in farmer organization. It takes values of 1 for the farmer who is a member of farmer organization or 0 for otherwise. Farmer organizations in Sri Lanka were initially established to facilitate paddy farming in various ways. These organizations are currently undertaking many functions mainly focused to address the issues related to paddy farming. Therefore, the effect of functions of organizations on marketing decisions of farmers will be evaluated by the empirical model.

STOR refers to availability of sufficient storage facilities at the farm households. It takes values of 1 for sufficient availability of storage facilities at the farm household level and 0 for otherwise. NONRAI is the non-rain affected harvest and takes the values of 1 if the harvest is not affected by rain and 0 for otherwise. FCREDIT refers the formal sector credit accessibility for paddy farming and takes values of 1 for the farmers who accessed the formal credit market and 0 for otherwise. Many previous studies have noted that the formal sector credit market accessibility is one of the decisive factors which help farmers to upgrade the paddy production and productivity, and to improve the capability of paddy farmers to gain the returns from the paddy marketing. Especially, due to insufficient resource availability of small scale farmers, earnings of farm households are not adequate to finance farming and other economic activities. INFCREDIT is informal sector credit and takes values of 1 for the farmers who get involved in informal credit market activities in terms of paddy farming. Theoretically, it is expected a negative relationship between informal sector credit market activities and dependent variable. EXTSERV measures the effectiveness of extension services provided by relevant government institutions in terms of paddy marketing. It takes the value of 1 for the farmer who has been provided the services in terms of paddy marketing activities by the government authorities and 0 for otherwise.

RESULTS

Paddy marketing structure in the survey area

The paddy marketing system in the area is largely concentrated on few large scale oligopolistic buyers. Figure 2 shows the paddy supply chain in the survey area. It clearly shows that about 85% of total marketable paddy harvest is handled by few large scale traders and millers directly by channelling the village level centres

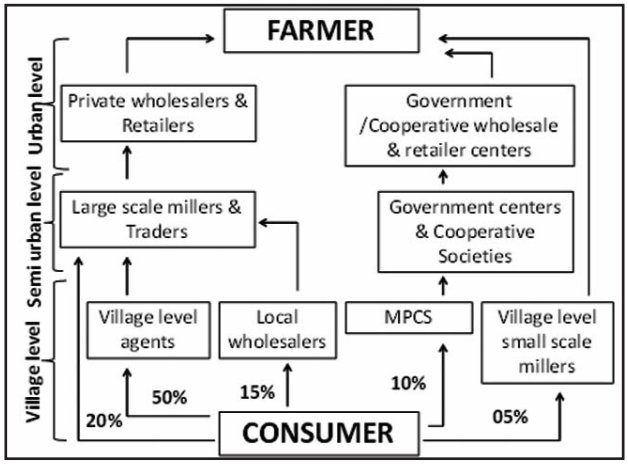

Figure 2: Paddy marketing system in the survey area.

and agents, and local wholesalers at the primary stage of paddy marketing (hamlet and village level). The rest of 15% is purchased by Multi-Purpose Cooperative Societies (MPCS), government agents, village level millers and retailers. Since a large share of market is controlled by few buyers and insufficient involvement of state and MPCS in the paddy marketing activities, farmers are not getting a fair trade at the area. This situation is further aggravated by the fact that the nature of the product (homogeneity) and number of producers. The large scale traders are basically functioning in the semi urban level. However, the survey found that the village level agents of the large scale traders confined the farmers with them in terms of paddy marketing through strategic actions such as credit provisions (in an informal way) for seeds, weedicide, pesticides, some machineries, etc. The results further show that, at the harvesting period, the price of paddy are going to be low due to the seasonal effect. However, some farmers with specific socio economic characteristics hold their harvest until the price is gone up at the market while avoiding the seasonal effect of paddy farming.

Characteristics of surveyed farmers in the area

Table 3 shows descriptive statistics of surveyed samples of each selected irrigation scheme. It reveals that the highest mean paddy productivity, which is 86.26 bushels per acre (1 bushel = 21Kg), is recorded by farmers in minor irrigation system while it is 85.2 and 79.6 bushels in major and rain-fed irrigation schemes, respectively. However, the productivity levels per acre range between 48 to 120, 45 to 140 and 40 to 133 bushels in major, minor and rain-fed irrigation schemes, respectively. However, a significant variation in the unit price can not be observed as derived mean prices in the selected schemes are fairly in more or less Rs, 28 per kg. Moreover, the average land size in the major irrigation scheme is 3.27 acre. But, it would be noted that in the establishment of farmer colonies in the area, a farmer had been given 5 acres for paddy cultivation. However, the field investigations reveal the issue of land fragmentation: a factor which affects the scale of paddy production and productivity in the major irrigation scheme. However, the average land sizes of minor and rain-fed irrigation schemes are 2.79 and 2.43 acres, respectively. Majority of farmers (56%) belong to educational category of less than grade 5 and the study found that 7% of farmers with qualification in the graduate level are in the paddy cultivation, especially in the major irrigation scheme. The average family sizes represented 4.6, 4.2 and 4.3 in main, minor and rain-fed schemes respectively. It is very close to the national average family size (4.21) derived by Department of Census and Statistics (DCS), Sri Lanka. The selected farmers are more experienced farmers in paddy farming and majority of them are member farmers of farmer organizations with esteemed experiences.

Likelihood factors affecting the returns from the paddy marketing

Before estimating the empirical logit model, test for multicolinearity was performed using multicolinearity diagnostic statistics, variance inflation factor (VIF) and tolerance (1/VIF), in order to check the correlation between independent variables (see appendix 4). Results showed that values of VIF are less than 2.1 in all variables in each system. The mean values of VIF in major, minor and rain-fed systems are 1.39, 1.56 and 1.57, respectively. Therefore, it confirmed the non-existence of strong correlation between independent variables specified for each empirical model. The results of the empirical logit models estimated for selected system are shown by Table 4, 5 and 6. The measure of goodness of fit, which is used by the model, is "pseudo R^2"

and it is 25%, 26% and 18% for major, minor and rain-fed irrigation schemes, respectively. Likelihood ratio (LR) statistics is used to test the null-hypothesis which states all the slope coefficients are simultaneously equal to zero. In this connection, all three estimated models are significant at 1% ($\alpha = 0.01$) indicating all the regressors in models, estimated for each irrigation scheme, have a significant impact on farmers' selling decision to obtain the price return from the paddy marketing. All variables, which are significant in the each model symbolised with theoretically expected sign. In addition, the models overall percentages of correct classification were 81.6, 75.3 and 71.8 for major, minor and rain-fed systems, respectively revealing the strength of models (see Appendix 5). Since heteroscedasticity could be a potential problem, LM2 test statistics for heteroscedasticity was derived for the models specified for each system in order to test the null-hypothesis (H:0) that error variances are all equal. The results showed that the LM2 test statistics for heteroscedasticity were 5.631, 4.954 and 4.238 for major, minor and rain-fed irrigation systems, respectively by proving that the error variances are homogeneous (P values: major = 0.548, minor = 0.436 and rain-fed = 0.381).

The variable LANDSIZE, in terms of major and minor irrigation schemes, is significant at 5% and 1% levels, respectively and positively correlates with dependent variable. It suggests that the farmers in the major and minor irrigation schemes with relatively large scale production practices have more tend to sell their harvest at higher price at the paddy market. The special feature of the farmers in these schemes is comparatively large size productions units due to initial conditions of the farmer colonisations. These farmers are more capable of using the advanced technologies and cultivation practices in paddy cultivation. Therefore, the economies of scale in paddy cultivation are obtained by them. It means farmers with large scale production practices are generally tend to be in the category of high price group and their resistant to internal and external economic factors are so strong. However, the variable LANDSIZE is not significant and not with the theoretically expected sign in terms of rain-fed irrigation scheme as small scale cultivators are more vulnerable to climatic and ecological factors.

The variable FCREDIT is significant at 10% level in terms of major irrigation scheme and it has positive relationship with dependent variable. It is evident that farmers are generally lacking in formal sector credit facilities in terms of farming activities. So, it is theoretically expected that enhancement of formal credit market activities, particularly in the agricultural areas, has positive impact on returns of the paddy farming. However, the estimations show that the formal sector credit market activities does not have significant impact on the determination of price returns of the paddy farming in minor and rain-fed irrigation schemes. In contrast, the variable INFCREDIT in each logit model is significant at 5%, 1% and 1% levels with theoretically expected sign in major, minor, and rain-fed irrigation systems, respectively. It indicates that the farmers who involved the informal sector credit activities in terms of functions of paddy cultivation, are more tend to be in the lower price category at the paddy market. The special feature of these farmers is that they are in severe debt-trap created by the local traders in terms of needs of the paddy cultivation such as seeds, chemicals, machineries, etc. and also the recurrent expenditures. In order to improve the price returns of these impoverished farmers, it is essential to strengthen the formal sector financial activities among them. However, the study still confirms the existing credit barriers to farmers and informal sector credit market activities, which hinder the price returns, in irrigation schemes.

The variable EXTSERV is significant at 5% level with positive sign in the model derived for major irrigation scheme. That means, the farmers who were benefited from government extension services in the major irrigation system are more likely to obtain the higher returns from paddy marketing indicating the effectiveness of government extension services. However, it is not significant for the minor and rain-fed irrigation schemes.

Moreover, the variable MEMFO, which is membership of farmer organization, is significant at 1% level with expected sign in both minor and rain-fed irrigation schemes. It is not

Table 3: Descriptive statistics of the surveyed samples in three different irrigation schemes.

Variables	Major irrigation system		Minor irrigation system		Rain-fed irrigation system	
	Mean	Stan. Dev.	Mean	Stan. Dev.	Mean	Stan. Dev.
Average production per acre	85.18	19.95	86.26	22.14	79.59	21.09
Unit price (per/Kg)	28.32	0.34	27.98	0.64	27.34	0.59
Land size (Acre)	3.27	1.86	2.79	1.70	2.45	1.12
EDUC (Level of education of farmer; none schooling – 1, until 5 grade - 2, 5 to O/L - 3, A/L - 4, graduate level – 5)	2.91	0.92	2.82	0.75	3.08	1.04
HHSIZE (Household size)	4.59	1.50	4.21	1.14	4.28	1.15
EXPF (Year of experience in paddy farming)	22.67	12.71	24.71	12.89	21.25	11.37
MEMFO (Membership in farmer organization; If member – 1, otherwise – 0)	0.81	0.39	0.85	0.36	0.75	0.43
LANDOWN (Land ownership; if land owner - 1, otherwise – 0)	0.73	0.44	0.65	0.48	0.80	0.39
STOR (Storage facilities; if available -1, otherwise – 0)	0.73	0.44	0.76	0.43	0.66	0.47
NONRAI (Rain affected harvest; if harvest is rain affected – 1, otherwise – 0)	0.75	0.43	0.09	0.28	0.69	0.46
FCREDIT (Formal sector credit; if farmer accessed the formal sector credit market – 1, otherwise – 0)	0.33	0.47	0.18	0.38	0.19	0.39
INFCREDIT (Informal sector credit; if farmer accessed informal sector credit market – 1, otherwise – 0)	0.24	0.43	0.18	0.38	0.17	0.37
EXTSERV (Extension services on marketing; If farmer was provided any services on marketing by govt. or non govt. – 1, otherwise – 0	0.53	0.50	0.32	0.47	0.25	0.43

significant for major irrigation scheme. It indicates that members of farmer organizations in minor and rain-fed irrigation schemes are well-benefitted by the functions of farmer organizations, particularly paddy marketing related functions. Also, the sufficient availability of storage facilities can be identified as one of the determinants in obtaining the price returns by the farmers in rain-fed irrigation scheme. Moreover, the land ownership of the paddy farming is critical for farmers in the minor and rain-fed irrigation schemes while it is not significant for the farmers in major irrigation scheme.

The conditional probabilities of particular event occurring is provided by table 3, 4 and 5 for each irrigation scheme. The positive significant coefficients of variables are associated with a higher probability of particular event occur compared to the reference group and negative significant coefficient of variables that is tend to less probability of particular event occur than the reference group. In terms of major irrigation scheme, extension services provided by government and farmers' involvement in formal sector credit activities show the highest probabilities of being in a group who achieved higher price returns from the paddy marketing (see table 4). In minor irrigation scheme, members of farmer organization, land owners (paddy field) and farmers in the higher educational level are with highest probabilities to be in a group who gain the highest return from the paddy marketing compared to a reference group (see table 5). Moreover, farmers with good storage facilities and farmers with ownership of their cultivated land in the rain-fed irrigation scheme are more tend to be with highest probabilities being in the group who gain highest advantages from the paddy marketing (see table 6).

The elasticity of farmers` decision on higher price return from the paddy marketing was computed at the mean value of each independent variable in empirical logit models specified for each system (see table 4, 5 and 6). In terms of variables, significant in each estimated model, the results showed that the probability of farmers` de-

Table 4: Factors affecting the probability of accessing the higher unit price at the paddy market – Major irrigation system.

Variable	Coefficient	Sta. Error	P>Z	Probability	Elasticity
Constant	-0.936621	1.615771	0.562		
EDUC	0.4942683	0.3184016	0.121	0.621111	0.339414
HHSIZE	-0.2513579	0.2107719	0.233	0.437489	-0.28399
EXPFPF	0.027932	0.0224467	0.213	0.506983	0.158274
MEMFO	-1.183795	0.861621	0.169	0.234371	-0.17334
LANDSIZE	0.3005312**	0.1473169	0.041	0.574572	0.240219
LANDOWN	0.1834464	0.7352202	0.803	0.545733	0.033381
STOR	1.04516	0.6796176	0.124	0.739844	0.147657
NONRAI	-0.3254523	0.7339519	0.657	0.419348	-0.05983
FCREDIT	1.140681*	0.6474693	0.078	0.757805	0.06825
INFCREDIT	-1.302993**	0.691243	0.059	0.213662	-0.05342
EXTSERV	1.584647**	0.6066281	0.009	0.829862	0.118581

Number of obs = 98
LR chi2(11) = 34.55
Prob > chi2 = 0.0006
Pseudo R2 = 0.2544 Log likelihood = -50.633368
*** P < 0/01 ** P < 0/05 * P < 0/1

cision on higher price return from the paddy marketing in main and minor irrigation system areas increases with in an increase of land size and decreases due to the expansion of informal sector financial market activities. It revealed that a 1% increase in land size will results in 0.24% and 0.43% increase of probabilities in farmers` decision to move to the higher price return area of paddy marketing. In addition, in terms of major irrigation system, the probability of farmers` decision to gain higher returns from paddy marketing increases with in an increase of formal sector credit market activities and expansion of government extension services. In rain-fed system, land ownership and storage facilities are critical variables as a 1% increase will results in an increase of probability of the farmers` decision by 0.160% and 0.162%, respectively. Also, percentage change of informal sector

Table 5: Factors affecting the probability of accessing the higher unit price at the paddy market – Minor irrigation system.

Variable	Coefficient	Sta. Error	P>Z	Probability	Elasticity
Constant	-8.342432***	1.997729	0.000		
EDUC	.9513395***	.3991516	0.017	0.721384	0.557948
HHSIZE	.1472253	.2221719	0.508	0.53674	0.168065
EXPFPF	-.0025884	.0210803	0.902	0.499353	-0.01467
MEMFO	2.104049***	.8251333	0.011	0.891296	0.166346
LANDSIZE	.5839268***	.1527657	0.000	0.64197	0.438874
LANDOWN	1.027601**	.5718678	0.072	0.736451	0.146395
STOR	.7976092	.6793791	0.240	0.689463	0.125346
NONRAI	-2.765091***	1.017345	0.007	0.05924	-0.11635
FCREDIT	.6937478	.6466029	0.283	0.6668	0.050248
INFCREDIT	-.1031485***	.5731959	0.009	0.474236	-0.00628
EXTSERV	.7498229	.6814161	0.271	0.67914	0.086598

Number of obs = 81
LR chi2(12) = 47.82
Prob > chi2 = 0.0000
Pseudo R2 = 0.2643 Log likelihood = -66.558652
*** P < 0/01 ** P < 0/05 * P < 0/1

Table 6: Factors affecting the probability of accessing the higher unit price at the paddy market – Rain-fed irrigation system.

Variable	Coefficient	Sta. Error	P>Z	Probability	Elasticity
Constant	-0.364437	1.697399	0.830		
EDUC	0.0263061	0.323715	0.935	0.506576	0.019187
HHSIZE	-0.1810808	0.2659582	0.496	0.454853	-0.20614
EXPFPF	0.0134568	0.032674	0.680	0.503364	0.076263
MEMFO	-2.394742***	0.8566335	0.005	0.083575	-0.14967
LANDSIZE	-0.0253463	0.0852295	0.766	0.493664	-0.02072
LANDOWN	1.810552**	1.092405	0.097	0.859429	0.160551
STOR	1.37377***	0.6031643	0.023	0.797989	0.162548
NONRAI	-0.3497741	0.6701232	0.602	0.413437	-0.06404
FCREDIT	-0.5333173	0.7875992	0.498	0.369744	-0.04052
INFCREDIT	-2.51485***	0.9498539	0.008	0.074824	-0.04248
EXTSERV	-0.2586354	0.6230014	0.678	0.435699	-0.0337

Number of obs = 78
LR chi2(12) = 26.00
Prob > chi2 = 0.0107
Pseudo R2 = 0.1840 Log likelihood = -57.64021
*** P < 0/01 ** P < 0/05 * P < 0/1

credit market activities negatively affects on percentage change of probability of the farmers` decision with regard to gaining the returns from paddy marketing.

CONCLUSION

The main objective of this paper was to assess the likelihood factors affecting the farmers selling decisions with regard to price gains at the paddy market. The study revealed that paddy marketing system in the study area is not competitive and fair due to the bargaining power held by few large scale traders and millers in the area and less involvement of government and the MPCS in supply chain activities. The results of the logit model revealed that large scale farmers are more tend to gain the price returns from the paddy marketing. This is mainly due to economic feasibility of large scale farmers. They are normally in a position to hold their harvest until resolving the existing surplus in the market due to the seasonality. In addition, the role of formal micro finance has not played enough in order to address the marketing issues of farmers of minor and major irrigation schemes. However, the study found that involvement of farmers with informal credit sources hinder the farmers' ability to cater the better price due to the constraints worsened by village and semi urban level private participants in the paddy supply chain. The ineffectiveness of extension services provided by government institutions with regard to marketing returns of paddy farming in minor and rain-fed irrigation schemes is also revealed by the study. It showed that the extension services of the government in major irrigation scheme are more significant in obtaining the price returns from the paddy marketing although few large scale private traders and millers are dominating the paddy market in the area. The role and functions of farmer organizations in major irrigation scheme should be further reviewed as statistics show the insignificant of the variable with respect to the dependent variable, price returns. As well, it found that land ownership is critical for the farmers in minor and rain-fed irrigation schemes. Therefore, in order to derive the higher returns from paddy marketing system following would be factors to be considered. Those are review of role of farmer organizations, systematic changes in government extension services including land title, improvement of institutional farm credit facilities by having the measures to avoid the farm debt trap initiated by informal sector, mechanize the informal credit system especially in minor irrigation scheme. In addition, appropriate measures should be taken by the government to avoid the market imperfections at large scale.

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Appendix

Appendix 1: The Sri Lankan agricultural sector can essentially be divided into two sub sectors; the plantation agricultural sector, which includes tea, rubber and coconut, focused primarily on the export market and the domestic agricultural sector, which includes paddy, other field crops, fruits, vegetables and sugar.

Appendix 2: There are two cultivation season in Sri Lanka; Maha season (October to March) and Yala season (April to September).(Table 1)

Appendix 3: After regaining independence, the government and private sector both played a significant role in the paddy marketing system. Mainly, two government institutions; the Paddy Marketing Board (PMB) which was established in 1971 targeting the realization of the Guaranteed Price Scheme (GPS) and to supply rice to consumers at an affordable price and Multi – Purpose Co operative Societies (MPCS) handled the large share in the purchase of paddy at a guaranteed price. Especially, the execution of the GPS introduced in 1948 with the objective of boosting farmers' income by offering them an assured price to provide protection from middlemen was initially operated by these two institutions. However, with the introduction of liberalization in 1977, the significance of the PMB was brought down dramatically and it became an ineffective organization due to the competition from the private sector. Under the new

Table 1: Paddy extent sown and harvested, average yield and production, and self sufficiency ratio

Year	Sown	Harvested	Average Yield	Production	Rate of Self Sufficiency
	000 Ha	000 Ha.	Kg/Ha	000 Mt.	
2000	878	832	3,857	2,860	
2001	798	765	3,953	2,695	
2002	852	820	3,893	2,860	
2003	983	911	3,761	3,067	
2004	779	720	4,086	2,628	
2005	937	915	3,963	3,246	100.65
2006	910	900	4,137	3,341	102.98
2007	816	796	4,386	3,131	96.59
2008	1,053	1,033	4,184	3,875	116.79
2009	977	941	4,337	3,652	107.37

Source: Department of Census and Statistics, Sri Lanka, 2010

Table 2: Collinearity Statistics of independent variables in each model

Variable	Major irrigation system		Minor irrigation system		Rain-fed system	
	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)	VIF	Tolerance (1/VIF)	VIF
EDUC	0.698	1.433	0.529	1.891	0.580	1.725
HHSIZE	0.691	1.447	0.761	1.315	0.721	1.387
EXPFPF	0.796	1.256	0.585	1.711	0.567	1.765
MEMFO	0.633	1.581	0.689	1.451	0.600	1.668
LANDSIZE	0.900	1.111	0.679	1.472	0.693	1.442
LANDOWN	0.655	1.562	0.633	1.581	0.698	1.433
STOR	0.760	1.315	0.559	1.789	0.519	1.928
NONRAI	0.697	1.434	0.695	1.438	0.646	1.549
FCREDIT	0.686	1.458	0.792	1.263	0.776	1.288
INFCREDIT	0.705	1.418	0.834	1.198	0.848	1.179
EXTSERV	0.738	1.355	0.476	2.102	0.504	1.983
Mean	0.724	1.397	0.657	1.565	0.650	1.577

Source: Authors calculations from the survey data

Table 3: Models Classification

	Observed	Predicted		
		0	1	Percentage correct
Major irrigation system	0	44	06	88.0
	1	12	36	75.0
	Overall percentage			81.6
Minor Irrigation system	0	43	08	84.3
	1	12	18	60.0
	Overall percentage			75.3
Rain-fed system	0	38	10	79.2
	1	12	18	60.0
	Overall percentage			71.8

Source: Authors calculations from the survey data
Note: The cut value is 0.50

economic policy, the private sector was also allowed to purchase paddy and it began to play a significant role in paddy marketing. In fact, during the post liberalization period, the open market price exceeded the guaranteed price, rendering to the government paddy purchasing institutions, importantly the PMB, as financially unviable institutions. In addition, various internal and external factors such as government bureaucracy, political interventions in purchasing system, corruption, low efficiency in the purchase of paddy and the distribution of rice compared to the private sector, extra cost on documentation and transportation, high risk contingent on rejection, facilities provided by the private sector to the farmers were all contributory factors which increased the vulnerability of the PMB. Under these circumstances, PMB stopped its operation in purchasing paddy by 1997 and finally it was closed down in 2000. Thus, currently 95 percent of the total paddy purchasing process is been handling by the private sector.

Appendix 4: (Table 2)

Appendix 5: (Table 3)