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## Farmers' Perceptions of Government's Rice Export Policy: A Case in Southern Cambodia

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This study aims to identify farmers' perceptions of government rice export policy focusing on farmers' awareness, perceptions of their production situation after introduction of policy and perceptions on impacts of the policy. Trankak and Chunkiri district, located in the provinces of Takeo and Kampot respectively, were selected to be study areas. In total, 301 out of 320 farmers' data collected through face-to-face interview in February to March 2017 were used in our analysis. Results of farmers' awareness show that 52 percent of sample farmers are aware of the policy, which media and officers are the main sources of their information. Higher education and more training obtain are positively associated with the awareness of the policy. 34 percent and 35 percent of farmers responded their rice price and market respectively were better after the introduction of rice export policy. However, only 23 percent of farmers perceived that rice yield had increased implying that the policy exerts itself to mainly boost market for export while neglecting farmers' difficulties in rice production. Results of impacts of the policy's measures indicate that government have succeeded in encouraging agricultural investment, developing infrastructure (road and electricity), and creating farmers groups; however, they have failed to reduce production cost, secure market stability, well operate supportive institutions, as well as build the irrigation system which is the immediate need of farmers. Results suggest that increasing rice traders/millers and better access to credit are important measures to increase rice yield. Forming cooperative, better access to inputs/tools and increasing rice traders/miller are the necessary measures to secure the price of paddy rice. To ease market of paddy rice, cooperative and better road condition will be the crucial tools.

**Key words:** Cambodia, Farmers' awareness, Rice export policy, Rice farming

### INTRODUCTION

The transformation of economic system to open market in 1995 has led Cambodia's economy to grow significantly in the last three decades. The rapid growth exerted a significant impact on country's development during the last decade, with per capita income more than double from USD 558 in 2006 to USD 830 in 2010 and USD 1,330 in 2016 (National Institute of Statistics [NIS], 2017). However, the country's poverty rate remains substantially high due to the low agricultural productivity, which many people in the country account for their living.

Being one of the most important sectors, agriculture has been prioritized for development by the Royal Government of Cambodia (RGC). Agriculture has contributed over 30 percent of Cambodian GDP during the last decade; however, in the year of 2015, the contribution of the sector dropped to 28.6 percent (Ministry of Agriculture, Forestry and Fishery [MAFF], 2016). The decline of agriculture's contribution is due to the substantial increase of industry and service sector. Crop production is among the large contribution of the sector shared 15.8 percent to the country's GDP in 2015 declined from 20.6 percent in 2011 (MAFF, 2016). Rice, accounting for over 50 percent of total crop production

and covering as much as 80 percent of the agricultural land, has been regarded as the main tool for reducing poverty rate and country's development (International Monetary Fund [IMF], 2009).

In 2009, rice production reached 7.6 million metric tons with 3.5 millions metric tons of surplus (MAFF, 2016); however, only 13,000 metric tons of milled rice or 20,000 metric tons of paddy rice was officially recorded for export, while there were much more export amounts that had not been officially recorded (MAFF, 2011). This suggests that Cambodia has big potential in milled rice export. To tackle this problem as well as to improve farmers' and country's economy, the government has an ambition to turn Cambodia into one of the major rice exporting country, in which rice-milling industry has to be improved.

With this regard, the government had launched many measures to address the challenges in rice sector; however, some of these measures were not sufficiently effective. Hence, in the year of 2010, the government had introduced the new value chain approach of rice policy named "the Promotion of Paddy Rice Production and Export of Milled Rice". With this policy, the government had set the year 2015 as the target year to: (1) achieve paddy rice surplus of more than 4 million tons and achieve milled rice export of at least 1 million ton; and (2) ensure the international recognition of Cambodian rice (MAFF, 2011).

As a result of rice export policy in 2010, the rice production has significantly increased. The cultivated

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area of rice production has expanded from 2.80 million hectares in 2010 to 3.05 million hectares in 2015, and the production has increased from 8.25 to 9.34 million metric tons between the years 2010 to 2015 (MAFF, 2016). With 2.52 million metric tons of milled rice surplus in 2010, the official report was shown 0.105 million metric tons of milled rice export. The milled rice export significantly increased to 0.538 million metric tons in 2015, yet it indicated a miss of its target to reached 1 million metric tons. However, the paddy rice surplus has been more than 4 million metric tons since 2011 hitting the target of the rice policy due to the expansion of cultivated area of rice production (MAFF, 2016). The rice statistic showed that there have been significant increase of rice cultivation area, total rice production, and amount of rice exports; however, rice yield has increased slightly from 2.97 t/ha to 3.09 t/ha in the years of 2010 and 2015 respectively (MAFF, 2016). Mund (2011), Hem (2013) and Khoy et al. (2016) noted that the majority of Cambodian rice farmers still produce rice with subsistence or small-scale commercial purpose with their relative small field and traditional farming systems, which is hard for government to tackle it.

Although the policy aimed to help farmers reducing poverty through increasing productivity and income, many difficulties are still challenging farmers suggesting the uncertainty of its impacts on farmers. To correctly evaluate whether this policy has positive impacts on farmers or not, it requires panel data before and after the introduction of rice export policy. Since we don't have such data, this study aims to identify farmers' perceptions of the rice export policy focusing on farmers' awareness, perceptions of their production situation and perceptions on the impacts of the policy's measures.

MATERIAL AND METHOD

Sample and Study sites

Trankak and Chumkiri district, located in the provinces of Takeo and Kampot respectively, were selected to be study areas because the two Southern provinces are among the main rice production zone consisted of many small-scale rain-fed lowland rice fields. Data was collected from February to March 2017 using structured questionnaire. In total, 301 out of 320 farmers were used in the analysis.

Data and analytical techniques

This study will determine the perceptions of rice farmers on rice export policy by paying particular attention to farmers' awareness of rice export policy, farmers' perceptions of rice production situation after introduction of the policy, and impacts of the policy's measures on farmers.

Farmers' awareness of rice export policy

To identify the awareness of rice policy, the binary answer (yes = 1; no = 0) was asked whether farmers are aware of the recent rice export policy or not. Then logit regression was employed to determine the relationship

between farmers' awareness and their characteristics. The logit regression is specified as:

$$Y(1:0) = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n + \epsilon$$

$$p(x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_1 + \dots + \beta_n X_n)}}$$

$$\text{logit} [p(x)] = \log \left[ \frac{p(x)}{1-p(x)} \right] = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n$$

where Y is binary answer of farmers (1 = being aware of rice export policy and 0 = otherwise); X (1, 2, ..., n) is independent variables or predictors to be included in analysis (detail in table 2);  $\beta$  (1, 2, ..., n) is correlation coefficient to be estimated;  $\epsilon$  is a random error. p(x) is the probability of farmers' being aware of rice export policy.

Farmers' perceptions of rice production situations

Farmers were asked to evaluate their rice production situations after introducing rice export policy. Yield, price and market demand situation were included for farmers to select among three likert scale answer (1 = decrease after introduction; 2 = neither; 3 = increase after introduction). We adopted ordered probit regression by Aitchison and Silvey (1957) to assess the correlation of these perceptions and farmers' characteristics. For further detail of the regression see the work of McKelvey and Zovoina (1975).

Consider the following model, which is built around a latent regression

$$y^* = \beta x' + \epsilon$$

Where  $y^*$  is unobserved. What is observable is:

$$y = 0 \text{ if } y^* \leq 0$$

$$y = 1 \text{ if } 0 < y^* \leq \mu_1$$

$$y = 2 \text{ if } \mu_1 < y^* \leq \mu_2$$

⋮

$$y = j \text{ if } y^* \geq \mu_{j-1}$$

The estimation of probability is:

$$P(y = 0 | X) = \Phi(-\beta x')$$

$$P(y = 1 | X) = \Phi(\mu_1 - \beta x') - \Phi(-\beta x')$$

$$P(y = 2 | X) = \Phi(\mu_2 - \beta x') - \Phi(\mu_1 - \beta x')$$

$$P(y = j | X) = 1 - \Phi(\mu_{j-1} - \beta x')$$

In this analytical framework presented above, we included farmers' perceptions of yield, price and market demand situations with 3 likert scale answer (0 = decrease after introduction; 1 = neither; 2 = increase after introduction) as dependent variable (y). All inde-

pendent variables (x) included in analysis are shown in table 2.

#### Impacts of rice export policy

In order to achieve the vision of the policy, four main measures had been launched including (1) measures related to paddy rice production, (2) measures on paddy rice collection and processing, (3) measures on logistics, and (4) measures related to marketing (MAFF, 2011). Under these four measures there are many specific measures related all stakeholders in rice sector to be implemented. To allow farmers to be able to evaluate the impacts of rice export policy, we included only 13 measures that directly involved with farmers, and

asked them to answer yes or no of those 13 measures. The detail of 13 measures is shown in table 1.

Descriptive analysis was used to discuss about impacts of policy by farmers' evaluation. Then we estimated the correlation coefficient between farmers' perceptions of rice production situations and this evaluation by using Pearson correlation matrix.

## RESULTS AND DISCUSSION

### Descriptive result

Table 2 shows farmers' socio-economic characteristics. Results indicated that sample farmers have

**Table 1.** Lists of policy measures included for farmers' evaluation

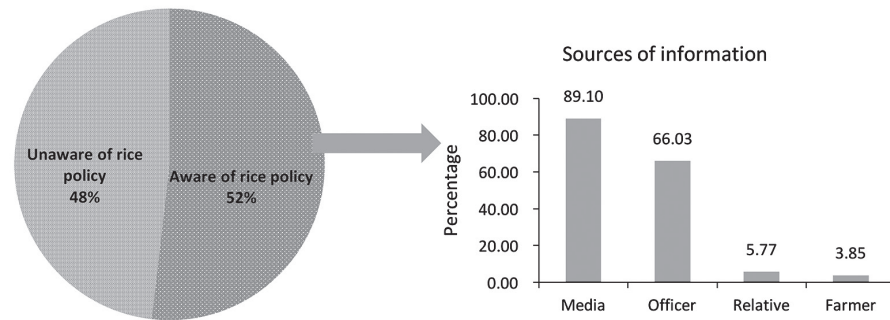
Measure	Questions	Name in figure	Answer
1	Have you got more access to rice inputs (high yield seed, fertilizer, machineries...) from 2010 until now?	Tools	<input type="checkbox"/> Yes; <input type="checkbox"/> No
2	Have you got more access to water from 2010 until now?	Irrigation	<input type="checkbox"/> Yes; <input type="checkbox"/> No
3	Have you got better roads in yours area from 2010 until now?	Road	<input type="checkbox"/> Yes; <input type="checkbox"/> No
4	Have you got better farm credit from 2010 until now?	Credit	<input type="checkbox"/> Yes; <input type="checkbox"/> No
5	Have you got better access to electricity from 2010 until now?	Electricity	<input type="checkbox"/> Yes; <input type="checkbox"/> No
6	Have you recognized there are some farmer groups in your area from 2010 until now?	Cooperative	<input type="checkbox"/> Yes; <input type="checkbox"/> No
7	Have you received land title in your areas from 2010 until now?	Land title	<input type="checkbox"/> Yes; <input type="checkbox"/> No
8	Has your area got more rice traders and millers from 2010 until now?	Buyer/miller	<input type="checkbox"/> Yes; <input type="checkbox"/> No
9	Has your area had any institution to buy your rice when there is no market from 2010 until now?	Supportive institutions	<input type="checkbox"/> Yes; <input type="checkbox"/> No
10	Has your area received any support from Rice Miller Association when there is market problem from 2010 until now?	Miller association	<input type="checkbox"/> Yes; <input type="checkbox"/> No
11	Has your area have any farmer groups, which provides agricultural loan, from 2010 until now?	Group loan	<input type="checkbox"/> Yes; <input type="checkbox"/> No
12	Has your area received any support from Agriculture Development Bank (ADB) for rice production and processing from 2010 until now?	Agri. bank	<input type="checkbox"/> Yes; <input type="checkbox"/> No
13	Have you got access to electricity with lower price from 2010 until now?	Electricity price	<input type="checkbox"/> Yes; <input type="checkbox"/> No

**Table 2.** Definition and descriptive results of variables used in regression analysis

Variable	Definition	Unit	Obs	Mean	Std. Dev.	Min	Max
Age	Age of household head	Years	301	42.69	11.44	21.00	78.00
Gender	Sex of household head (1=Male; 0=Female)	Dummy	301	0.90	0.30	0.00	1.00
Education	Years of schooling of household head	Years	301	5.32	2.81	0.00	12.00
Farming labor	Numbers of family members involving in rice farming	Numbers	301	2.65	1.04	1.00	8.00
Rice field size	Total rice field size	Ha	301	1.09	0.87	0.05	5.10
Selling	Sale of rice product (1=Yes; 0=No)	Dummy	301	0.61	0.49	0.00	1.00
Other crop	Growing other crops other than rice (1=Yes; 0=No)	Dummy	301	0.07	0.26	0.00	1.00
Off-farm job	Having off-farm job (1=Yes; 0=No)	Dummy	301	0.68	0.47	0.00	1.00
Household income	Total household income per year	USD	301	2684.53	2112.87	25.00	14987.50
Credit-use	Being in debt with credit institutions (1=Yes; 0=No)	Dummy	301	0.58	0.49	0.00	1.00
Machinery	Having machinery for rice production (1=Yes; 0=No)	Dummy	301	0.50	0.50	0.00	1.00
Training	Numbers of agricultural training received in 2016	Numbers	301	1.44	1.71	0.00	10.00
Membership	Belonging to farmers group (1=Yes; 0=No)	Dummy	301	0.31	0.46	0.00	1.00

Source: Survey (2017)

## Farmers' awareness of rice export policy



Source: Survey (2017)

**Fig. 1.** Farmers' awareness and information sources of rice export policy.

43 years old of average age, and 90 percent of them were male-headed. On average, farmers have low level of education with five years of schooling. The average labor in rice farming of each household is 2.65 people with average rice field size around 1.09 hectares per household. Results show only 61 percent of farmers have sold their products in previous year. Most of farmers produce only rice production, which only 7 percent of them engage in other crop activities, but surprisingly 68 percent of them are having off-farm job suggesting the main source of income of many households are not from rice farming, and as a result, rice farming become part time activity for them. An average household income is around USD 2685 per year, of which USD 912 is from their off-farm job. Since microfinance have increased in recent years, 58 percent of farmers have been using credit. With 50 percent of farmers, owning

farm machinery, it is a good sign of farm modernization in rice production. Only 31 percent of rice farmers belong to agricultural group, and on average they obtain 1.4 training in 2016.

**Farmers' awareness of rice export policy**

Figure 1 explains farmers' awareness of rice export policy as well as the sources of information they receive. Results suggest that 52 percent of farmers' in study areas are aware of the policy, and the main sources of information are from media and officers (NGOs and Government officers) with 89 percent and 66 percent respectively. It indicates that farmers are not well informed about related policy, and many of them are not interested in government policy even though their area is the main rice production zone in the country, and the policy itself is directly involved with them. As Wesseler

**Table 3.** Logit estimation of farmers' awareness of rice export policy

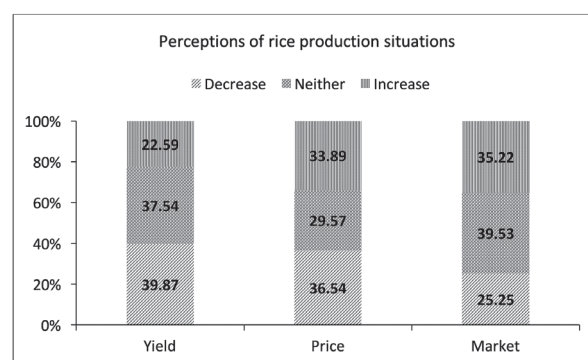
Rice policy	Coef.	P>z	Marginal effects (Probability = 0.4997)	
			dy/dx	P>z
Age	0.0019	0.9010	0.0005	0.9010
Gender	0.1124	0.8280	0.0281	0.8280
Education	0.1203**	0.0230	0.0301**	0.0230
Farming labor	0.0210	0.8850	0.0052	0.8850
Rice field size	-1.0495***	0.0000	-0.2624***	0.0000
Selling	-0.7076*	0.0590	-0.1748*	0.0530
Other crop	0.4798	0.4180	0.1181	0.4040
Off-farm job	0.2391	0.5110	0.0597	0.5100
Household income	-0.0002**	0.0290	-0.0001**	0.0290
Credit-use	0.0744	0.8280	0.0186	0.8280
Machinery	-0.3616	0.2880	-0.0902	0.2850
Training	0.3679***	0.0000	0.0920***	0.0000
Membership	0.4032	0.2170	0.1003	0.2130
Constant	0.5551	0.5640		
Regression's indicators	N = 301; LR chi <sup>2</sup> (13) = 89.71; Prob > chi <sup>2</sup> = 0.0000; Pseudo R <sup>2</sup> = 0.2152			

Source: Survey (2017)

Note: \*, \*\* and \*\*\* are significance level at 90%, 95% and 99% respectively

and Brinkman (2003) noted that information is very important for development and innovation, and information gaps are often occurred between farmers and policy makers. Hence, all related information should be disseminated to farmers. The next section of this study will further discuss about factors influencing farmers' awareness of the policy.

The determinants of farmers' awareness were estimated by logit regression analysis as shown in Table 3. Results suggest that education level and number of training are positively correlated with the awareness of the policy. With one unit increase in education and training, farmers are likely to increase their awareness 3 percent and 9 percent respectively. Certainly, higher educated farmers are able to obtain various sources of information as Koesling *et al.* (2008), Mzoughi (2011), Azam (2015) and Khoy *et al.* (2015) documented that education will help farmers to acknowledge new farming practices due to their information accessibility. With agricultural training participation, farmers would be more accessible to related information since they are able to meet many farmers and officers in the training, then the information of related policy will be inevitably reached them. Farmers having larger rice field, selling rice product and earning higher income are less likely to be aware of the policy. One unit increase in rice field, selling, and household income is associated with 26 percent, 17 percent, and 0.01 percent decrease in policy awareness respectively. This implies that better farmers are less informed about related information, and they are not the target group for obtaining the training, which results in less contact with agricultural officers. Furthermore, farmers with better condition usually have off-farm job, so they do rice farming as their part time



Source: Survey (2017)

**Fig. 2.** Farmers' perceptions of rice production situations after introduction of the policy.

activities, and are less likely to pay much attention on rice farming policy. This result is contrasted with Acheampong *et al.* (2017) who noted that larger farmers in Ghana tend to make good use of information on fertilizer application than those with smaller rice land sizes.

#### Farmers' perceptions of their rice production situations

Figure 2 indicates farmers' perceptions of their rice production situation after introduction of the policy. Results suggest that 34 percent and 35 percent of farmers responded their rice price and market respectively were better after the introduction of rice export policy. However, only 23 percent of farmers perceived that rice yield has increased after the introduction, and 40 percent of them responded their rice yield was getting decrease. Results imply that the policy exert itself to

**Table 4.** Ordered probit estimation of farmers' perceptions of rice production situation

Variables	Yield Gain		Price Gain		Market Gain	
	Coef.	P>z	Coef.	P>z	Coef.	P>z
Age	0.0024	0.7450	-0.0139*	0.0990	-0.0094	0.2300
Gender	-0.2283	0.3600	-0.2005	0.4970	-0.3427	0.2240
Education	0.0140	0.5890	0.1085***	0.0000	0.0446	0.1030
Farming labor	0.0275	0.6910	0.2611***	0.0010	0.1264*	0.0750
Rice field size	-0.0222	0.8360	-0.3604***	0.0070	-0.4727***	0.0000
Selling	0.0890	0.6360	-0.9962***	0.0000	-0.5873***	0.0030
Other crop	-1.2152***	0.0000	0.3252	0.3080	-0.0384	0.9010
Off-farm job	0.2340	0.1820	0.0861	0.6640	0.1001	0.5880
Household income	-4.74E-05	0.2510	-3.65E-04***	0.0000	-1.24E-04***	0.0030
Credit-use	0.4190**	0.0140	-0.0050	0.9780	0.3150*	0.0750
Machinery	0.0497	0.7680	-0.2289	0.2180	-0.1692	0.3440
Training	0.1446***	0.0020	0.0815	0.1020	-0.1251**	0.0130
Membership	-0.0128	0.9350	-0.0696	0.6980	-0.0048	0.9770
/cut1	0.2284		-1.9658		-2.3316	
/cut2	1.3041		-0.7501		-0.8430	
Regression's indicators	N = 301; LR chi <sup>2</sup> (13) = 31.58; Prob > chi <sup>2</sup> = 0.0028; Pseudo R <sup>2</sup> = 0.049		N = 301; LR chi <sup>2</sup> (13) = 198.6; Prob > chi <sup>2</sup> = 0; Pseudo R <sup>2</sup> = 0.3013		N = 301; LR chi <sup>2</sup> (13) = 162.58; Prob > chi <sup>2</sup> = 0; Pseudo R <sup>2</sup> = 0.2496	

Source: Survey (2017)

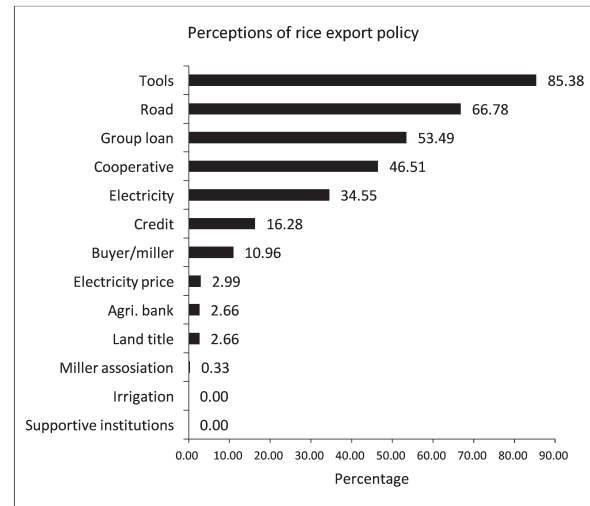
Note: \*, \*\* and \*\*\* are significance level at 90%, 95% and 99% respectively

mainly boost market for export while neglecting farmers' difficulties in rice production. According to MAFF (2016), there have been significant increase of rice cultivation area, total rice production, and amount of rice exports after the introduction of the policy; however, rice yield has increased slightly from 2.97 t/ha to 3.09 t/ha in the years of 2010 and 2015 respectively. Mund (2011), Hem (2013) and Khoy *et al.* (2016) noted that the majority of Cambodian rice farmers still produce rice with subsistence or small-scale commercial purpose with their relative small field and traditional farming systems, which is hard for government to tackle it. Furthermore, the majority of rice farmers have become part time farmers since most of them have been seeking off-farm job as their main source of income instead of rice farming.

Table 4 shows the determinants of farmers' perceptions of their rice production situation. The results of ordered probit estimation suggest that yield perception tend to get increase when farmers using credit and having more numbers of training, while farmers perceived yield decrease when they have other crop farming besides rice production. This implies that agricultural training and credit play important role in improving rice yield, while farmers could not manage rice farming properly when they have other crop farming since they have limited labor and time to manage their rice field.

Higher education level and more numbers of farming labor significantly increase rice price perception; however, farmers with larger rice field, rice commercial purpose, and higher household income negatively perceive that rice price increase after introduction of the policy. This suggests that education and having enough labor will help farmers to get some good price of their product since they have enough knowledge and labor to manage it properly. On the other hand, with larger field size that is associated with commercial purpose, farmers are required knowledge and technologies in postharvest to find the better price period after harvesting. Most of farmers have sold their paddy rice shortly after harvesting since they need more labor, capital and knowledge to store or process their rice for a better price period. Farmers who have higher income would not depend solely on rice farming since they are likely to have off-farm job or other sources of income, so they will not store their paddy rice for higher price after harvesting.

The term "market gain" here is how easy farmers could sell their products. Results show that farming labor and credit-use are positively associated with farmers' perceptions of market gain. While rice field size, selling, household income, and training are negatively correlated with farmers' perceptions. Similar to price gain perception, having enough labor and capital will help farmers to seek for good market, since they need labor and capital to transport and do other tasks after harvesting. Again with larger rice field that is associated with commercial purpose, farmers need more labor, capital and knowledge to store or process their rice if there is no market opportunity after harvesting. The same with price gain perception, farmers' with higher income



Source: Survey (2017)

**Fig. 3.** Farmers' perceptions towards impacts of rice export policy.

are not interested in rice market since the main source of income is not rice farming. Surprisingly, farmers who have more numbers of training perceive negatively of market gain because most of the training might be mainly related to production techniques rather than market.

### Impacts of rice export policy

Figure 3 presents the results of farmers' responses about 13 measures that directly involved with them. Results show that 85 percent of farmers have got more access to rice inputs after the introduction of policy followed by better roads and group loan with 67 percent and 53 percent respectively. 47 percent of farmers responded that there are cooperatives presenting in their areas, and 35 percent of them have got better access to electricity. However, only 16 percent and 11 percent of farmers have got better credit and traders respectively in rice production. Moreover, the policy have failed to reach other measures in study areas such as reducing electricity price, providing support by Agricultural Development Bank, offering land title, offering support from miller association, building irrigation system, and functioning supportive institutions. Results suggest that the government have succeeded in encouragement of agricultural investment, development infrastructure (road and electricity), and creation of farmers groups; however, they have failed to reduce production cost, secure market stability, well operate supportive institutions, as well as build the irrigation system which is the immediate need of farmers.

Table 5 explains the relationship between farmers' perceptions of production situations and policy's measures. Results indicate that farmers' perception of yield gain is positively associated with (ranked from high to low correlation coefficient) increasing rice traders/millers, better credit condition, better access to inputs/tools, having land title, and cooperative. In contrast, group loan is negatively correlated with yield gain perception.

**Table 5.** Relationship between perceptions of production situations and policy's impacts

Variables	Yield gain	Price gain	Market gain
Tools	0.1756***	0.3681***	0.2608***
Road	-0.0208	0.1963***	0.4204***
Group loan	-0.2262***	-0.0057	0.2069***
Cooperative	0.1139**	0.4425***	0.51***
Electricity	0.0088	-0.0853	-0.112*
Credit	0.2972***	0.0676	0.1297**
Buyer / miller	0.3544***	0.3027***	0.2994***
Electricity price	-0.0366	-0.1572***	-0.048
Agri. bank	0.0906	0.2022***	0.1929***
Land title	0.1441**	0.0545	0.0858
Miller association	-0.0619	0.0707	0.0674

Source: Survey (2017)

Note: \*, \*\* and \*\*\* are significance level at 90%, 95% and 99% respectively

Rice price perception has positive correlation with (ranked from high to low correlation coefficient) cooperative, better access to inputs/tools, increasing rice traders/millers, getting support from Agricultural Development Bank, and better road condition, but it has negative correlation with electricity price. Similar to price gain perception, farmers' perception of market gain is positively correlated with (ranked from high to low correlation coefficient) cooperative, better road condition, increasing rice traders/millers, better access to inputs/tools, group loan, getting support from Agricultural Development Bank, better credit condition. On the other hand, better access to electricity is negatively correlated with market gain perception.

Results suggest that increasing rice traders/millers and better access to credit are important measures to increase rice yield since these two measures will ensure farmers' capital and market in rice production. Forming cooperative, better access to inputs/tools and increasing rice traders/millers are the necessary measures to secure the price of paddy rice since cooperative act as important role in seeking better market for farmers, while better access to inputs/tools and increasing rice traders/millers will help to reduce production cost and secure rice market for them. To ease market of paddy rice, cooperative and better road condition plays a crucial tools because cooperative will be a good network of farmers to get into market, and better road condition will ease the transportation and reduce some cost of farmers as well as traders.

## CONCLUSION AND RECOMMENDATION

This study aims to identify farmers' perception of government rice export policy focusing on farmers' awareness, perceptions of their production situation after introduction of policy and perceptions on impacts of the policy.

Results of farmers' awareness show that 52 percent of sample farmers' are aware of the policy, which media and officers are the main sources of their information. Higher education and more training obtain are positively associated with the awareness of policy. Whereas, farmers having larger rice field, selling rice product and earning higher income are less likely to be aware of the policy.

34 percent and 35 percent of farmers responded their rice price and market respectively were better after the introduction of rice export policy. However, only 23 percent of farmers perceived that rice yield has increased, and 40 percent responded their rice yield was getting decrease. Results imply that the policy exert itself to mainly boost market for export while neglecting farmers' difficulties in rice production, which resulted in slightly yield improvement. The results of ordered probit estimation suggest that yield perception is getting increase when farmers using credit and having more number of training, while farmers perceive yield decrease when they have other crop farming. Higher education level and more numbers of farming labor positively effect rice price perceptions; however, farmers with larger rice field, rice commercial purpose, and higher household income negatively affect rice price perceptions. Farming labor and credit-use are positively associated with farmers' perceptions of market gain. While rice field size, selling, household income, and training are negatively correlated with farmers' perceptions of market gain.

Results of impacts of the policy's measures indicate that the government have succeeded in encouragement of agricultural investment, development infrastructure (road and electricity), and creation of farmers groups; however, they have failed to reduce production cost, secure market stability, well operate supportive institutions, as well as build the irrigation system which is the immediate need of farmers. Results suggest that increasing rice traders/millers and better access to credit are important measures to increase rice yield. Forming cooperative, better access to inputs/tools and increasing rice traders/millers are the necessary measures to secure the price of paddy rice. To ease market of paddy rice, cooperative and better road condition will be the crucial tools.

Based on the results, information is very important for development and innovations, so all related information should disseminate to farmers. Providing frequent training and broadcasting in media would be useful for farmers to receive information and knowledge about recent issues and information. Since the policy have been neglecting farmers' difficulties in rice production, government should introduce the policy which farmers should be actively involved with it. Providing more training, better credit condition, solving labor problem, forming cooperative, encouraging agricultural investments would be helpful for farmers to obtain better yield, price and market. Lastly, expanding irrigation system should be the priority policy since many farmers in the country are facing water problems.



## AUTHOR CONTRIBUTIONS

R. KHOY carried out the each operations of study's design, performed the data collection and statistical analysis, drafted the first version of manuscript and finalized the final version of the manuscript. T. NANSEKI is responsible for whole process of the research including each stage of the research. T. NANSEKI and Y. CHOMEI improved the study's design, supported the data collection, refined the interpretation of the results, and edited the manuscript. All authors have read and approved the final manuscript.

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Appendix 1. Marginal effects of ordered probit estimations

Variables	Marginal effects of yield gain			Marginal effects of price gain			Marginal effects of market gain					
	Pr(0) = 0.3956	Pr(1) = 0.3957	Pr(2) = 0.2087	Pr(0) = 0.2940	Pr(1) = 0.4558	Pr(2) = 0.2502	Pr(0) = 0.1662	Pr(1) = 0.5320	Pr(2) = 0.3018			
	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z		
Age	-0.0009	0.7450	0.0002	0.7460	0.0007	0.7460	0.0023	0.2300	0.0009	0.2670	-0.0033	0.2310
Gender	0.0853	0.3420	-0.0150	0.1280	-0.0703	0.3900	0.0658	0.4740	0.0012	0.9260	-0.0670	0.5160
Education	-0.0054	0.5890	0.0014	0.5920	0.0040	0.5890	-0.0374***	0.0000	0.0029	0.3950	0.0345***	0.0000
Farming labor	-0.0106	0.6910	0.0027	0.6930	0.0079	0.6910	-0.0899***	0.0010	0.0069	0.4030	0.0830***	0.0010
Rice field size	0.0085	0.8360	-0.0022	0.8360	-0.0064	0.8360	0.1241***	0.0070	-0.0096	0.4130	-0.1146***	0.0070
Selling	-0.0344	0.6370	0.0090	0.6490	0.0254	0.6330	0.3137***	0.0000	0.0161	0.5840	-0.3298***	0.0000
Other crop	0.4433***	0.0000	-0.2356***	0.0010	-0.2077***	0.0000	-0.1026	0.2590	-0.0095	0.7360	0.1121	0.3400
Off-farm job	-0.0908	0.1840	0.0260	0.2450	0.0648	0.1670	-0.0299	0.6660	0.0028	0.7320	0.0271	0.6600
Household income	1.83E-05	0.2510	-4.65E-06	0.2700	-1.36E-05	0.2520	1.26E-04***	0.0000	-9.69E-06	0.3940	-1.16E-04***	0.0000
Credit-use	-0.1616**	0.0140	0.0449**	0.0410	0.1117**	0.0120	0.0017	0.9780	-0.0001	0.9780	-0.0016	0.9780
Machinery	-0.0191	0.7680	0.0049	0.7690	0.0143	0.7680	0.0787	0.2160	-0.0060	0.4740	-0.0727	0.2180
Training	-0.0557***	0.0020	0.0142**	0.0160	0.0415***	0.0020	-0.0281	0.1050	0.0022	0.4530	0.0259	0.1020
Membership	0.0049	0.9350	-0.0013	0.9360	-0.0037	0.9350	0.0241	0.7000	-0.0022	0.7540	-0.0219	0.6950

Source: Survey (2017)

Note: \*, \*\* and \*\*\* are significance level at 90%, 95% and 99% respectively