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University of California, Davis  
M.S. Capstone Report**

**Project Title:  
Determinants of Farmers' Willingness:  
An Analysis of Participation in Taiwan's Direct Payment Program in  
Rice.**

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## **Abstract**

In 2016, the Taiwanese government implemented a pilot program called “Direct Payment Program (DP program) to test potential changes to one of the country’s most important agricultural policies: the government purchase program. Through the support of a Henry A. Jastro Research Fellowship, I have traveled to Taiwan to conduct research in August-September 2017 to collect questionnaire survey and interview data in person. This research project seeks to understand and evaluate the impact of the implementation of the DP program from the perspective of rice farmers and government agricultural administrators. The results conclude that the DP program participants tend to dedicate to rice, have a higher area planted; they have more planted rice varieties. The characteristics of the non-participants tend to be the groups that considered as the groups need a traditional income support program. This paper develops my graduate capstone project for International Agricultural Development program in UC Davis.

**Keywords:** Rice, Government Purchasing, Direct Payment, Taiwan, Decision Making, Risk

## 1. Introduction

The agricultural industry is the most heavily protected across the world. There are several reasons for agricultural protectionism: first, almost every country aims to maintain certain levels of domestic agricultural production to for national food security purposes, especially for countries that are food importers. Second, protective agricultural policies are intended to mitigate excessive market fluctuations inherent in agriculture to stabilize the revenue of farmers. Especially the agricultural supply is usually inelastic. Third, market failures associated with the multifunctional roles(Potter & Burney, 2002) of agriculture could be corrected by some agricultural policies instruments. Last, agricultural policies sometimes involve interests groups such as farm organizations for rent-seeking behaviors whose driving force is increasing farm incomes under government protection(Moon, 2011).

In general, there are two main parts of government intervention actions in agriculture: stabilizing commodity prices and farmers' income and correcting the market failure of multifunctional roles of agriculture. Farmers and farm are closely involved in the agricultural industry. The small farm is the most affected by the fluctuating commodity prices and affected their agricultural income. Agriculture's income problems tend to be explained as existing because the price elasticity is low in food consumption. The contemporary evidence indicates that the demand for agricultural products expands slower than the supply of agricultural products, especially in staple food such as rice, wheat, and corn(Hill, 2018), even though Malthus disagreed this argument.

Rice is the most important food crop in Taiwan. There are three phases of agricultural policies that related to the quantities of demands for rice from the 1940s to the 2000s(Ferng, 2009). At the first phase, the Taiwanese government encouraged rice production to meet the substantial increasing demand in the 1940s after World War II. In the 1950s, the governments implemented a serious of agricultural policies such as Sale of Public Lands, Land-to-the-tiller Program, Rice-Fertilizer Barter Program to improve the domestic food supply. Industrialization of Taiwanese was achieved by agriculture's contribution after the 1960s. The quantity demands of processing food, mechanization of agriculture and the innovation of agricultural technology expand the rice production scale of rice in Taiwan(Francks, 2010). These changes established the modern rice production model in Taiwan. In 1974, the government established "Food Stabilization Fund" for a guaranteed price program for rice growers. All of these policy instruments increased rice yield successfully—the rice planting area has increased from 560,016 hectares in 1946 to 790,248 ha in 1975("Council of Agriculture. Agricultural Statistics,," n.d.); the yield of brown rice per hectare increased from 1585 kg to 3156 kg during 1946–1975. At the second phase, the boosting quantities of domestic rice supply and the decreasing demand for rice have lead to an oversupply of rice in Taiwan. Thus, the government started to implement a new program called The Rice Production and Rice Field Diversion Program" in 1984 to encourage rice framers to grow forage crops or leave land fallow to decrease domestic rice supply(Teng, 2003). In this stage, the area planted with rice decreased about almost a half to from 645,855 hectares to 347,989 hectares. At the third phase, a new program called "Adjustment of Paddy Field and Uplands Utilization Program" has been implemented since 1997 due to adverse the effects of free trade under WTO' framework and the effect of the guaranteed price program. Under the agreement

for the rice market, 8% of annual domestic rice consumption is required from the import market. This program encouraged rice farmers to fallow their land or plant other vegetable crops. However, the guaranteed price program (also called the government purchase program) has led to an overstock of rice held by the government and a reduction in rice quality on the market as farmers began favoring rice varieties with higher yields over those with better quality until today. Thus, the Taiwanese government implemented a pilot program which the government will provide fixed payments (called Direct Payment Program) for income lost from the concepts that farmers sell on the free market versus selling to the government in 2016.

Due to the trial characteristics of the pilot program, this study aims to provide the initial analysis toward to understanding what kinds of characteristics of rice producers will be the policy participants in Taiwan and how will this affects the government's ability to achieve the policy goals. This paper is organized as follows. The next section introduces more details about contemporary rice policies. Section three address empirical method of including a questionnaire survey and interviews. The following section provides result and discussion of analysis. The final section concludes, drawing the major implications and policy suggestions for future research agenda. This paper develops my graduate capstone project for International Agricultural Development program in UC Davis through the support of a Henry A. Jastro Research Fellowship in 2017.

## 2. Background

### 2.1 Main Rice Policies in Taiwan

There are three main rice policies in Taiwan, which are Government Purchasing, ( Rice Price Guarantee Purchase Program, RPGP Program) land set-aside and crop-rotation (Cultivation System Adjustment and Fallow Land Reactivation Program) and the tariff-rate quota (TRQ) under World Trade Organization(WTO)'s framework. The government rice purchasing program, RPGP Program, has been implemented since 1974, allowing the Taiwanese government to purchase rice at guaranteed prices. This program expanded and led to overproduction, which forced government to use Cultivation System Adjustment and Fallow Land Reactivation Program (the formal name of Set-Aside and Crop-Rotation program) (Huang, 2015a) to address the problem. This alternative program encourages rice producers to either fallow their rice land or plant alternative crops such as vegetables or other food grains. Moreover, the full amount of the quantities of import rice allowed under Taiwan's tariff rate quota (TRQ) in 2018 and 2019 are forecast at 126,000 tons.

TRQ system is an import system established a quota and a two-tier tariff regime for affected commodities under WTO framework. The definition of TRQ states from OECD "Imports within the quota enter at a lower (in-quota) tariff rate while a higher (out- of-quota) tariff rate is used for imports above the concessionary access level<sup>1</sup>". TRQ system of rice in Taiwan is divided into private sector imports (35 percent) and public sector imports (65 percent) (Yang &Blandford, 2011). While the three rice policies are being adjusted all the time, they affect economic changes in the in the rice market, including

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<sup>1</sup> OECD Agricultural Outlook: 2001-2006, OECD, 2001, Annex II – Glossary of Terms.

market prices, the quantities of rice production, farmers' income and benefits, and government spending. Thus, any policy adjustment will also affect the decision of rice farmers in production.

## **2.2 Rice Price Guarantee Purchase Program: Price Support with Government Purchases**

Theoretically, the government sets the floor price and purchases any products offered to it at the support price under a purchase program. Rice Price Guarantee Purchase Program has been implemented since 1974, that allows Taiwanese government to purchase rice at guaranteed prices. This program has been adjusted over years as time goes by. In the past, there is no limitation for quantities of guarantee purchasing. However, the program has been restraining the amount of rice that the government purchased per hectare since 1997(Lee, 2013).

There is a three-tiered system for the current price support program (Table 1), which means the government purchases rice in three different prices: planned-purchasing price, guidance-purchasing price, and surplus-purchasing price. The first two-tiered prices, planned-purchasing price and, guidance-purchasing price, have co-existed from the beginning of the program. The third-tiered price, surplus-purchasing price, has started to be implemented in 2003 to stabilize market price from falling below the average costs of production. There are some policy considerations for the Taiwanese government to have this program. First, this program can support producers' income. Second, the rice products they purchase are used as the public food stocks for food security. However, the quantities of procured rice have been increased six times since the program was



implemented. The operating cost of this program including storing procured rice and managing the Government Entrusted Warehouses are increasing massively year by year, and the financial budget of this program are in deficit every year. Thus, the government has started to implement the Set aside and Crop Rotation program since 1974. This alternative program encourages rice producers to either fallow their rice land or plant alternative crops such as vegetables or other food grains. In addition, the government increased the channels of distribution for the excess procured rice such as domestic and international food aids; allowing private sectors to auction procured rice; smashing old procured rice (more than two years) into chicken and cattle feed. However, the operating cost of this program is in deficit annually.

**Table 1.** Three-tiered price support system with government purchases

	The First Tier	The Second Tier	The Third Tier
	Planned Purchase	Guidance Purchase	Surplus Purchase
The support price of Japonica Rough Rice (NTD/hectare)	\$26	\$25	\$23
The support price of Glutinous and Indica Rough Rice (NTD/hectare)	\$22	\$21.6	\$20.6
Volume of purchase of the first season of a year (kg/hectare)	2000	1200	3000
Volume of purchase of the second season of a year (kg/hectare)	1500	800	2400

### 2.3 New Pilot Program: Direct Payment

In the second season of 2016, the Taiwanese government implemented a new rice pilot program, into six cities or towns. They offer a new pilot program called “Rice Direct Payment (DP Program)” to give the test locations a new choice between government purchase program and the new one. Conceptually, the government will provide deficiency

payments for any income lost if farmers sell on the free market versus selling to the government. In reality, they calculated the difference price between the guaranteed price and the average market price between 2013 to 2015, plus incentives for the environmental benefits of rice farmland. Thus, it is a fixed amount of payment for every hectare applied, called direct payment. Moreover, this new program also provided an additional incentive for the farmland then under contract. In the first season of 2017, the government enlarges their scale to 20 cities or towns; In the second season of 2017, they expanded to 50 cities or towns which includes a total of 23 percent of rice planting around the county. This DP program is nationwide since 2018. In 2018, the new program also provides an incentive for certified organic farmland (not limited to rice farmlands). However, rice farmers still can choose between DP program and the government purchase program(Huang, 2015b)(Yang &Han, 2016).

**Table 2.** The Direct Payment System

Payment/Incentives (per hectare)	First season	Second Season
Direct Payment	NTD 12,500	NTD 9,000
Environmental Benefits	NTD 1,000	NTD 1,000
Under contract farmland	NTD 1,500	NTD 1,500
Certified organic farmland	NTD 1,500	NTD 1,500

### 3. Research Methodology

#### 3.1 Research site

Participants of this study (Figure 1) were drawn from the six townships (Yangmei, Xinwu, Xiushui, Fuxing, Houbi, Meinong) of Taiwan. Three of them (Yangmei, Xiushui, and Meinong) are the sites that the new project implemented (dual system of two programs). That is, the trial of a dual system of direct payment and guaranteed purchasing program was implemented. The other three sites are only implemented traditional guaranteed purchasing program are the town closed to the treatment site, which has similar characteristics with the treatment sites such as growing similar rice varieties or having similar rice growing season.



**Figure 1**

Map of the study areas. This paper draws on research conducted in Taiwan from the six townships (Yangmei, Xinwu, Xiushui, Fuxing, Houbi, Meinong). Three of them (Yangmei, Xiushui, and Meinong) are the sites that the new project implemented (dual system of RPGP program and DP program). This map is modified from <https://www.arcgis.com/home/index.html>.

### **3.2 Research questions**

The purpose of this research is to seek to know how to define the “success” of this new pilot project and understanding what kinds of characteristics of rice producers will be the policy participants in Taiwan. There are two research questions: first, Understanding the characteristics of rice producers in Taiwan who will be the DP program participants; and second, Whether the program objectives are achieved and how to define the “success” of this new pilot program. The following hypotheses were set: 1. The new pilot program participants are willing to change the current varieties they grow under the incentives of this program. 2. Large scale rice producers/farmers have more possibility to participate in this new pilot project. 3. The rice producers who have already grown market-oriented rice varieties have more intention to participate in the new pilot project. Since the limitation of the sample size of this study, this study was treated as a pre-experimental study. Thus, this study is aimed at understanding the impact evaluation of this new pilot project cost-effectively to determine whether a potential explanation is worthy of further investigation.

### **3.3 Survey instrument design and Sampling procedure and survey implementation**

The data used in this analysis came from two parts: a survey of rice farmers in Taiwan and interviews of another 6 stakeholders/local experts, including owners of local paddy nursery centers, a professor in local university, growers’ associations officials and cooperative manager. For the survey of rice farmers in Taiwan, first, a draft of the survey instruments was constructed from literature reviews which were written in Mandarin (APPENDIX 2). Every participant ((contacted with National Farm Association and

Township (City) Office)) will receive a paper format questionnaire in person. Each questionnaire takes approximately 10-15 minutes and will be held in public space such as community center. For interviews, every interview takes approximately one hour and will be held in public space such as café or restaurant or via mobile communication such as skype. The interviewee was provided the outlined of interviews questions previously. The local informant interviews sought the understand the goals, scope, and design elements of the DP program.

### **3.4 Empirical Framework**

#### **3.4.1 Random Utility Model**

The decision of a rice producer to participate in the new pilot program can be analyzed with a binary model. Under the assumption of the consistency of individual household behavior., the model is based on the maximization of an underlying utility function. To maximize utility, an individual, rice producer, will buy that quantity of the good to exhaust his/her budget to allocate the resource and subject to the budget constraints to achieve the highest utility possible (Nicholson & Snyder, 2011) (Lienhoop & Brouwer, 2015) (McFadden, 1973).

The utility of participation is a function to estimate how program characteristics, farm characteristics and demographics related to participation in the program. A random utility function can be defined as to assume that a rice producer aims to maximize his/her utility and derives utility,  $U_i^p$ , from choosing to participate in DP project when faced with a choice between participation and non-participation, where p denotes participation (1 if yes; 0 if no). The derived utility can be expressed as a sum of explanatory or

deterministic variables ( $V_i$ ) and a stochastic error term ( $\varepsilon_i$ ) representing the unobservable aspects of utility (Eq (x)).

$$U_i^p = V_i + \varepsilon_{ij}$$

where  $U$  is the utility of an individual for alternative  $I$ ,  $V$  is the explanatory or deterministic component of utility, and  $\varepsilon$  is a stochastic error term representing the unobservable aspects on choice.  $V$  can be expressed a linear function (Eq (x)):

$$V_i = \sum \beta_i X_{ij}$$

Where  $\beta_i$  is the parameters associated with dependent variables  $X_{ij}$

The model can be written to demonstrate a rice farmer's decision-making process, given by:

$$P_i^* = \begin{cases} P_i = 1, & \text{if } U_i^0 < U_i^1 \\ P_i = 0, & \text{if } U_i^0 \geq U_i^1 \end{cases}$$

where 1 represents participation in DP project and 0 indicates non-participation.

The probability of participation can be derived from the above utility function. Maximum likelihood estimation is used to estimate the parameters of the probability  $\Pr(P_i=1)$  that a rice producer with a set of explanatory variables,  $X_{ij}$ , and vector  $\beta$  of unknown parameters will choose to participate in DP program. Assuming that the probability of participation  $\Pr(P_i=1)$  is a logistic cumulation distribution function that a rice farmer will choose to participate in the DP project, which is given by:

$$P_i(\text{participate}) = \frac{e^{\beta'x_{ij}}}{1 + e^{\beta'x_{ij}}} , \quad \text{for } i = 0,1$$

Next, the logit transformation has desirable properties in that it is linear in its parameters. The parameters of those variables were estimated by maximum likelihood estimation (MLE) s that are assumed to influence the participation decision (Zbinden & Lee, 2005).

$$\log \left[ \frac{P_i}{1 - P_i} \right] = \beta'_i x_{ij}$$

A binary logit model can be used to look at what influences farmers' decisions to participate in the DP program. From the survey, respondents indicated their willingness to participate or not participate in the DP project providing a dichotomous dependent variable.

This study uses binary logistic regression analysis to model two decision-making issues of rice producers. First, modeling the decision of a rice producer to participate in the DP program, and then using the results from the first model to understand the determinants indicators, a farmer who plant more than one rice variety (*MULTIVAR*), of rice farmers' willingness to participate and modeling indicators in the relationship between indicators and other characteristics of respondents, and second, does the participants are cooperatives members or not (*COOP*).

### 3.4.2 Experts Interviews

Interviewing is considered one of the most common types in qualitative research. One-on-one interviews are the most common way to conduct interviews. However, focus

groups interviewing is another widely used research method. In general, there are four common types of interviews conducted in social sciences research. The first type is the unstructured (open-ended) interview. This type of interview, which is also called a non-directive interview, is meant to gather in-depth information that has a great flexibility to both interviewers and interviewees. The second type of interviewing is called the structured interview, that mostly interviews questions are designed 'yes' or 'no' types response for interviewees. The third type of interviewing is called the semi-structured interviews. The research aims to provide some structure based on the purpose of study but allow flexibility with the interviewees have more spontaneous descriptions. In this study, all the form of interviews designed as semi-structured interviews.

Due to the limitations of quantitative data, this study implements a research method, expert interviews, to try to fulfill the blanks of information in this study. Under the framework of reference in sociology of knowledge, the term "expert" can be described as: "a person is attributed as expert by his role as informant" which focusing on the local context of knowledge. Another term defined in this study is "expert knowledge", which is characterized as a context that is organization and function in a field of practice to become hegemonial and can influence other actors in structuring the conditions. The analysis of expert knowledge should be covered during interviewing: First, the analysis should follow a well-defined protocol. Second, expert knowledge is inclusive and exclusive by the communicative practice of insider groups and networks. Third, we should aware the knowledge of expert is the expert's habitus, which his/her awareness of contingencies, and his/her strategies of self-assurance.



## 4. Result and Discussion

The questionnaire contains questions on the producers' demographic characteristics, farm structure, and perceived behavioral controls. the *questionnaires* are designed and *administered to local rice farmers in person*. In total, 143 questionnaires were received from 6 towns, which are Yangmei, Xinwu, Xiushui, Fuxing, Houbi, Meinong (Table 3). Three of them (Yangmei, Xiushui, and Meinong) are the sites that the new project implemented (treatment locations); the other three sites are the towns close to the treatment site, which have similar characteristics with the treatment sites such as growing similar rice varieties or having similar rice growing season. (Table 4). Meanwhile, *six 6 stakeholders/local experts were interviewed including owners of local paddy nursery centers, a professor in local university, growers' associations officials and cooperative manager* (Table 5).

**Table 3**

Location #	Zip code	Site Name	Location	Program Implemented	Freq.	Percent
1	326	Yangmei	Northern Taiwan	Yes	21	14.69
2	327	Xinwu	Northern Taiwan	No	36	25.17
3	504	Xiushui	Central Taiwan	No	30	20.98
4	506	Fuxing	Central Taiwan	Yes	19	13.29
5	731	Houbi	Southern Taiwan	No	25	17.48
6	843	Meinong	Southern Taiwan	Yes	12	8.39
Total					143	100

**Table 4** Description of the variables included in the models

Variable	Description	Unit
<b>Outcome Variable</b>		
PARTICIPATED	participants who participated this pilot project before	0=no; 1=yes
<b>Farm structure</b>		
AREA	area of planting (all)	hectare
RAREA	the area of land that participants plant rice	
RENT	the participant rent land or not	0=no; 1=yes
ANTA	the land area that the participant rent	hectare
MANHH	someone else to manage farm with participants (with non-household members) (1: yes; 0:no)	0=no; 1=yes
INDICA	indica rice (1: yes; 0:no)	0=no; 1=yes
MULTVAR	plant more than one varieties (1: yes; 0:no)	0=no; 1=yes
GLUTI	Glutinous rice (1: yes; 0:no)	0=no; 1=yes
<b>Farmer's Characteristics</b>		
FEMALE	Farmer's gender	0=male; 1=female
AGE	age	year
EDUYR	education years	year
EXP	experience that participating growing rice	year
COOP	coop member	0=no; 1=yes
<b>Perceived Behavioral Controls</b>		
PROG	The participant who joins any government agriculture programs before	0=no; 1=yes
GPPROP	participants who join any government purchase program before	0=no; 1=yes
OPROG	participants who join any other rice policy before	0=no; 1=yes
KNPROG	participants who heard this pilot project before	0=no; 1=yes
FALLOW	participant who join fallow program in this year (1: yes; 0:no)	0=no; 1=yes
OCROPS	participant who plant other plants in this year (1: yes; 0:no)	0=no; 1=yes
ZIPCODE	zip code number	

**Table 5** List of interviewees

<b>ID</b>	<b>Interviewee Background (Role)</b>
1	An executive supervisor of a local farmer's association
2	An outsourcing farmer(consultant) and nursery owner
3	An outsourcing farmer
4	A Professor in the university
5	A general manager of local farmer's association
6	A director of supply and marketing department in a local farmer's association

## 4.1 Descriptive Results in treatment groups

Table 6 and Table 7 shows the results of descriptive data. The chi-square test and fisher's exact test are use with non-parametric data, which includes nominal and ordinal data; while the t-test is used to analyze continuous variables.

### 4.1.1 Baseline characteristics: age (*AGE*), education level(*EDUYR*) and experience(*EXP*) in rice farming

Even though there was no difference in age of those willing or unwilling to participate the new pilot project in the treatment sites, the data shows that the participants might be more interested in policy or technical assistance because the participant group tends to come into the sector a little older and less experienced in farming. Thus, they might look for technical assistance from public sectors. Another finding in this study is the mean of age of the participants in treatments groups is 63.76. There are some theoretical reasons about aging agricultural labor in Taiwan. The main reason of aging agricultural labor is due to shifting of labor from rural to city in young and middle-aged labors. There are three factors that affect aging of the agricultural labor: economic factors (the wage differences between sectors wage, non-agricultural employment opportunities, the ratio of

agricultural land), social factors (modernization) and physiological factors (increased life expectancy)(楊坤鋒 (1989)。台灣農業勞動力老化之分析。國立中興大學農業經濟研究所碩士論文，台中市。取自 <https://hdl.handle.net/11296/6a93h3>).

#### **4.1.2 Farm structure, and perceived behavioral controls:**

The project participants tend to participate less in other rice programs except government purchasing program (*OPROG*). This might because the participants have less reliance on public rice programs. Third, from what kinds of rice do they plant: the tendency to participate is much higher if they grow some specialty rice (*GLUTI*, *INDICA*) both the chi-square and Fisher's exact test for specialty rice show a significant difference (Table 3). The data also shows that the non- participants do not plant multiple varieties( $p=0.012$ ). Fourth, from rental (*RENT*), land area of rice planting (*ANTA*): the data shows that the people who were joining the program have larger farms and they tend to be renters. It is almost two-thirds of all the area planted is rented. (Table 6). Fifth. From the participation of fallow and crop rotation programs (*FALLOW*; *OCROPS*): the project participants tend to be more aggressive regarding management, that is, they are more concentrated on rice more specialized in rice. They have less participated in the fallow and crop rotation program (Table 7).

Significantly more participants would have chosen to participate in the new project if they are cooperative members (*COOP* ;66.67% vs.33.33%,  $p= 0.021$ ). The project participants are much more likely to be members of the cooperative. The cooperative has decided that its membership because it is good for the membership because it is good for the cooperative. For example, the cooperative can recommend their members to plant

specialty crops and can market it together to create market power. Also, the cooperative can recommend can also recommend to their members to participate in the program.

Farmers who don't hire more non-household labors (*MANHH*) indicate the willingness to participate in the new project. In other words, some of these non-participants may want to do all the farm work by themselves as much as they did before, an activity that they engage in. It might because these non-participants are older and not as well informed as participants' groups. Thus, non-participants tend to hire more labors from outside.

In sum, the project participants tend to not use very much labor from outside, which means they manage their farms with their family members. They are dedicated to rice, have a higher area planted; they have more planted rice varieties. Moreover, the project participants pay attention to their cooperative members who might work jointly with all their neighbors or relatives. There is an essential link between the cooperative and the members which affect their decision making.

**Table 6**

Variable	Outcome variable				p-value
	Non-Participated		Participated		
	n	Mean (Std. Dev)	n	Mean (Std. Dev)	
AGE	24	64.583(14.69)	28	63.04(13.43)	0.69
AREA	14	2.665(1.23)	28	4.5(1.88)	0.4178
RNTA	12	3.82(2.46)	18	5.5(2.83)	0.6784
RAREA	23	2.63(1.29)	28	3.87(1.62)	0.5617
EXP	23	37.87(2.87)	27	30.43(20.85)	0.3701

**Table 7**

Variable	Outcome variable				p-value
	Non-Participated		Participated		
	n	%	n	%	
FEMALE					0.531(0.69)
0	20	44.44	25	55.56	
1	4	57.14	3	42.86	
EDUYR					0.212(0.243)
6	9	45	11	55	
9	4	44.44	5	55.56	
12	11	57.89	8	42.11	
16	0	0	4	100	
PROG					
0	1	33.33	2	66.67	0.646(1)
1	23	46.94	26	53.06	
GPPROP					0.46(0.59)
0	2	66.67	1	33.33	
1	22	44.9	27	55.1	
OPROG					0.135(0.158)
0	6	31.58	13	68.42	
1	17	53.13	15	46.88	
KNPROG					0.052(0.084)
0	5	83.33	1	16.67	
1	19	41.3	27	28.7	
RENT					0.477(0.568)
0	10	52.63	9	47.37	
1	14	42.42	19	57.58	
FALLOW					0.036(0.068)
0	13	37.14	22	62.86	
1	11	68.75	5	31.25	
OCROPS					0.67(0.771)
0	14	43.75	18	56.25	
1	9	50	9	50	
ZIPCODE					<0.001(<0.001)
326	14	66.67	7	33.33	
506	2	10.53	17	89.47	

843	8	66.67	28	53.85	
<b>COOP</b>					0.015(0.021)
0	13	68.42	6	31.58	
1	11	33.33	22	66.67	
<b>MANHH</b>					0.054(0.106)
0	15	38.46	25	61.54	
1	9	69.23	4	30.77	
<b>INDICA</b>					0.099(0.22)
0	23	48.94	24	51.06	
1	0	0	3	100	
<b>MULTVAR</b>					0.01(0.012)
0	21	56.76	16	43.24	
1	2	15.38	11	84.62	
<b>GLUTI</b>					0.019(0.024)
0	21	55.26	17	44.74	
1	2	16.67	10	83.33	

## 4.2 Regression Estimates

Based on the theoretical framework above, a rice farmer in the trials locations chooses the program option (or non-participation) that generated the highest utility, subject to the available constraints. The factors hypothesized to influence rice farmers utility, and affects the participation decisions, are given in Table 8. They relate to the characteristics of the household, the farm characteristics, and nature of information diffusion, and include variables such as farm size, family size and labor resource, farmer age and education, accessibility of information, and other variables, many of which have been shown to be relevant factors in previous empirical studies. Logistic regression was estimated based on the survey data using the STATA software package. Maximum Likelihood Estimation was used to estimate the coefficient (Table 8). A farmer who lives Fuxing Town was found to be associated with participation with an odds ratio of 1.632, is roughly nine times more likely to participate in DP program other than a farmer who does

not live there. One reason might be because the farmers in this location tend to grow Indica rice. The farmer who plant multiple rice varieties in one season (*MUTIVAR*), as expected, significantly increases the probability of participation in the DP program with an odds ratio of 1.689. A farmer who plants more than one variety might be more dedicated to rice planting or have more skills which more chance might have to produce higher market value rice. Farmers age (*AGE*) was found to slightly significantly influence participation with a positive sign. A farm hired labors from outside (*MAGNHH*) was found to be negatively significantly with participation. That is, a farm who manage by the farmers she/herself or only farming with family tends to participate in the DP program. A farmer who is a cooperatives member more likely to participate in DP program other than a farmer who does not become a cooperatives member with an odds ratio of 1.422. As mentioned, the cooperative might recommend their members to plant specialty crops and can market it together to create market power. Coefficients of the other include variables did not exhibit statistically significant influences on the decision to participate in the DP program

From the logit regression for the DP program participation model, the results as expected possible to predict some characteristics of farms or farmers have more probability to participate in the DP program. Next, two determinants indicators in the model, *MULTIVAR* and *COOPMBR*, were selected to modeling indicators in the relationship between indicators and other characteristics for all samples includes trials and control groups (Table 9). The first selected determinant, *MULTIVAR*, is a farmer who plants more than one rice variety will have a higher probability to participate in the DP program. The secondly selected determinant, *COOPMBR*, is a farmer who is a cooperatives member



will have a higher probability to participate in the DP program.

Regarding the first selected determinant, *MULTIVAR*, the coefficient of farm size (*LNRICEAREA*) was estimated to be positively signed, as expected, and significant at the 5% level. The odds ratio is 2.537. The significant might be associated with crop diversification, or land fragmentation can act as a risk (such as price risk or weather risk ) reducing strategy for rice farmers ((Manjunatha, Anik, Speelman, & Nuppenau, 2013)). The coefficient of the length of rice farming experience (*EXP*) is negative and significant (at the 10% level) related to a farmer who plants more than one rice variety. Maybe it is more likely that older farmers tend to plant one variety on their farm. The coefficient of planting specialty rice (*GLUTIN*, *INDICA*) are positively and significantly (at the 1% and 10% level, respectively) related to planting multiple varieties in a farm. The significance might be associated with crop diversification, or land fragmentation can act as a risk-reducing strategy for rice farmers like above.

The result for logistic regression estimates, odds ratios for the second indicator, *COOPMBR*, are also presented in Table xx1. The coefficients of two variables, farm size (*LNRICEAREA*) and planting aromatic rice varieties (*AROMA*), are positively and significantly associated with a farmer who is the members of a cooperative.

**Table 8** Logit regression estimates and test statistics for the DP participation model

VARIABLES	Coefficient	Average marginal effects	Odds ratio
mutivar	5.658** (2.872)	0.524** (0.230)	1.689** (0.389)
lnricearea	-0.209	-0.0193	0.981

	(0.722)	(0.0670)	(0.0658)
coopmbr	3.801**	0.352***	1.422***
	(1.711)	(0.128)	(0.181)
506.zipcode	4.755**	0.490***	1.632***
	(1.855)	(0.109)	(0.179)
843.zipcode	-1.172	-0.110	0.896
	(1.413)	(0.121)	(0.108)
age2	0.00177	0.000164	1.000
	(0.00101)	(8.34e-05)	(8.34e-05)
Female	-1.540	-0.143	0.867
	(2.538)	(0.232)	(0.202)
exp	-0.0522	-0.00483	0.995
	(0.0373)	(0.00315)	(0.00314)
eduyr	0.219	0.0203	1.020
	(0.320)	(0.0291)	(0.0297)
maghh	-0.666	-0.0617	0.940
	(1.558)	(0.143)	(0.135)
gp_prog	-0.498	-0.0461	0.955
	(3.231)	(0.299)	(0.285)
nextgen	0.312	0.0289	1.029
	(1.463)	(0.136)	(0.140)
Constant	-11.83		
	(8.481)		
Observations	44		
Pseudo R <sup>2</sup>	0.5711		

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 9** Logit regression estimates and test statistics for determinants indicators model

Variables	MULTVAR		COOPMBR	
	Coefficients	Odds ratio	Coefficients	Odds ratio
lnricearea	0.931*** (0.248)	2.537*** (0.630)	0.591** (0.254)	1.806** (0.459)
exp	-0.0272* (0.0146)	0.973* (0.0142)	9.16e-05 (0.000149)	1.000 (0.000149)
coopmbr	0.0609 (0.700)	1.063 (0.744)		
prog	-0.562 (1.301)	0.570 (0.742)	-0.375 (1.207)	0.687 (0.830)
glutin	2.200*** (0.737)	9.026*** (6.654)	-0.573 (0.798)	0.564 (0.450)
indica	1.429* (0.790)	4.175* (3.300)	-1.252 (0.808)	0.286 (0.231)
aroma	0.780 (0.672)	2.181 (1.466)	3.259*** (0.652)	26.03*** (16.98)
magnhh	0.464 (0.675)	1.590 (1.074)	0.252 (0.648)	1.287 (0.833)
nextgen	0.597 (0.664)	1.816 (1.205)	0.104 (0.596)	1.110 (0.662)
mutivar			0.112 (0.709)	1.118 (0.792)
Constant	-1.439 (1.516)	0.237 (0.359)	-0.724 (1.325)	0.485 (0.642)
Observations	127		127	127
Pseudo R <sup>2</sup>	0.3635		0.3810	

### 4.3 Interviews Findings

Do the policy participants change the rice varieties they plant?

One of the main questions addressed was: do you think the new pilot project participants will be willing to change the rice varieties base on the context of this new pilot project?

Four of six respondents report that they don't think the new pilot project participants will be willing to change the rice varieties base on the context of this new pilot project.

However, different respondents have different reasons to support their point of views.

Three respondents mentioned the difficulty for the rice producers to sell their rice, that is, the difficulty in searching for the market distributions. ID6, a director of Supply and Marketing Department in a local Farmer's Association, states that the rice producers in the near area might have little chance to change the rice varieties they plant unless they can find someone to sign a contract with them to guarantee to buy their product before they plant rice seedlings. Both ID-4 and ID-5 mentioned that there are not enough quantities of market demand for either high price/ specialty rice so far. Other respondents mentioned the issues of natural limitations of rice production. ID-2 states the rice production is highly dependent on the climate and weather. It might take a couple of years for a rice farmer to learn how to plant a rice new variety even though they plant other varieties before. Moreover, the purchasing sources of seedling of certain varieties from a nursery is an issue for rice producers. Third, the confidence of the government or a policy program is another category reported, but in two different sides. ID-4 was mentioned that some rice farmers would not change the varieties they plant due to framers have lost their confidence in the government and the projects that the government promotes. However, ID-1 states that he believes rice producers will force to change the

rice variety eventually because he believes this new pilot project will replace the government purchasing program and become the main rice agricultural program in the future. In sum, most respondents report that rice farmer will not change their behavior if both rice programs existed at the same time.

## 5. Concluding Remarks

The program should be designed to encourage people to join. For this new pilot project, first, the government might join because we desire to have less rice produced because of high expenditures for public stock-holding. Second, the government hopes to help rice producers to move away from traditional varieties to higher value varieties. However, another important objective for agricultural programs under this circumstance is for stabilizing farm income, which might be one of the most crucial objectives. In 2015, the total receipts per household in Taiwan was NTD1,167,284 dollars. However, the total income per household of food grains farms was around NTD 990,000 dollars, which was 16% lower than the national average(“farm household survey, 2015,” n.d.). Total household income includes all earned income both from farming (NTD 340,000 dollars) , government payments (NTD 120,000 dollars) and non-farm activities(NTD 530,000 dollars). Thus, the design of the new program should not only provide the incentive to participate in the new program but also subsidized the farm income level.

From the result above, the project participants tend to be dedicated to rice, have a higher area planted; they have more planted rice varieties. However, the government agency should consider the characteristics of the non- participants that make them averse to participation, and whether these causes some unexpected issues which related to the goals of the government?

There are several goals that the Taiwanese government would like to achieve under this pilot program. First, they aim to encourage rice farmers to change high-yield varieties

they grow to high market value varieties. Second, another primary goal for government is to reduce the massive operating cost of the government purchase program for years.

However, the results of the study show that the government is not achieving their goals fully. On the one hand, they achieve some aspect in some ways. For example, this new pilot program encourages some group of people selling more rice in the market.

However, on the other hands, I do not believe the government is solving problems. The majority of GP program, in large part, is the older farmers who are not very interested in changing. That is, they might satisfy to be living off of a government subsidy.

Meanwhile, the government has also worried these farmers might completely go out of business if the new pilot program has implemented entirely, which they might quit producing and leave the land idle. Thus, the government either has to persuade these farmers to join other programs they might be interested in, or has to transfer their land to other people to address this problem.

### **5.1 The sustainability of agricultural programs**

This study found out the risk of participation in an agricultural program might be more important to farmers than the programs themselves. Some interviewee reported the conflicts between different rice programs and the rapid change of agricultural programs lead to the result that they lost trust from the government and lowering the willingness to the participation of agricultural programs. Respondents reported that he was participating in a rice program called “Small Landowners Big Tenant (SLBT)” program” which the government gives rent subsidy to tenants to encourage than enlarge the scale of farming. The SLBT program has started from 2008, and the length of a contract between landlord and tenant is three years. However, the SLBT program revised the program in 2012 to

restrict the tenants that under contract are not allowed to participate in government purchasing program anymore. This limitation affects more than 70 percent of the tenants in the SLBT program, which causes the distrust of government and the agricultural programs. Thus, some respondents were mentioned that they do not want to participate in the new pilot program because they do not believe the sustainability of the project and have low willingness to participate.

## **5.2 Policy suggestions**

### **5.2.1 The applicants of the new pilot project should have set eligibility requirements to participate in the pilot program.**

This study suggests that the program participants should be involved in the government purchasing program within three years to qualify for participating in the new project. The result reveals that the participants in the study are the majority who does not involved in the government purchasing program before, which means that they already sell their rice to the market, not because of this new pilot program. Thus, this study suggests the new project should set the requirements to allow only people who involved in government purchasing program before can participate in the new project.

### **5.2.2 The payment recipients should be the states in the deeds (written contracts).**

Many landowners in Taiwan tend to not too willing to write written contracts with tenant farmers due to an act called “Land-to-the-Tiller” act which has been abolished in 1993. This act was to allow the land tenants to own the possession of farming right as long as they are using the land in agricultural usage. Even though this act was abolished in 1993, the fear of land has taken from the tenants by signing a contract cannot be erased. Thus, a deed with clear statement between landowner and tenants would be the requirements of



eligibility to participate either the new project or future agricultural programs.

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Appendix

Appendix 1



## Appendix 2

尊敬的農業先進 您好：

我們正在進行一項研究，想瞭解水稻農民選擇販售水稻的管道的原因及對於「稻作直接給付試辦計畫」的看法。我們想邀請您填答這份問卷。本問卷填答時不需具名，您的資料也僅作為學術分析之用，決不做個別揭露或其他用途，希望能得到您支持與協助。所填答的資料皆具保密性，因此請您依實際情況安心填答。感謝您的參與。

敬祝 平安 健康

美國加州大學戴維斯分校 國際農業發展研究所  
碩士研究生 陳愛陵謹啟

### ~~~~~問卷開始~~~~~

#### 一、 公共政策的認知(請填寫或在適當的□內打勾)

1. 請問您過去三年內曾經領到過政府的農業補助或給付計畫嗎?  
☐1.有 ☐2.沒有(請跳答第 3 題)
2. 請問您曾經參與下列與水稻相關的農業補助或給付計畫呢?(複選)  
☐1.公糧稻穀收購計畫(繳公糧) ☐2.調整耕作制度活化農地計畫(休耕轉作)  
☐3.小地主大佃農 ☐4.天然災害救助 ☐5.其他\_\_\_\_\_ (請說明)。
3. 請問您曾經聽過「稻作直接給付試辦計畫」嗎?  
☐1.有 ☐2.沒有(請跳答第 7 題)
4. 請問您的資訊來源是?(複選)  
☐1.家族成員 ☐2.鄰居 ☐3.村鄰長 ☐4.公所 ☐5.農會 ☐6.民間糧商 ☐7.網路  
☐8.廣播 ☐9.電視新聞 ☐10.報紙 ☐11.其他\_\_\_\_\_ (請說明)
5. 請問您有參與過「稻作直接給付試辦」計畫嗎?  
☐1.有 ☐2.沒有(請跳答第 7 題)
- 6-1.請問您參加的時間是?(如果參加超過一次，請複選)  
☐1.去年 2 期作 ☐2.今年 1 期作 ☐3.今年 2 期作
- 6-2.請問您選擇參加此試辦計畫的原因是?

---

(請說明理由)。

- 6-3.請問您加入此試辦計畫前後，種的水稻品種有改變嗎?  
☐1.有 ☐2.沒有(請跳答第 6-5 題)

- 6-4.加入**前**的水稻種類: ☐1.稈稻 ☐2.私稻 ☐3.圓糯 ☐4.長糯  
加入**前**水稻品種: \_\_\_\_\_(請說明)。  
加入**後**的水稻種類: ☐1.稈稻 ☐2.私稻 ☐3.圓糯 ☐4.長糯  
加入**後**的水稻品種: \_\_\_\_\_(請說明)。
- 6-5.加入**前後**種植的水稻種類:☐1.稈稻 ☐2.私稻 ☐3.圓糯☐4.長糯  
加入**前後**種植的水稻品種都是: \_\_\_\_\_(請說明)。
- 6-6 您覺得您會因為此試辦計畫而改變您種植的水稻的品種嗎?  
☐1.會 ☐2.不會 ☐3.不一定
- 6-7.請問您加入此試辦計畫前後,販售水稻的管道有改變嗎?  
☐1.有 ☐2.沒有(請跳答第 6-9 題)
- 6-8.加入**前**將稻米賣到: ☐1.繳公糧 ☐2.民糧 ☐3.其他\_\_\_\_\_(請說明)。  
加入**後**將稻米賣到: ☐1.繳公糧 ☐2.民糧 ☐3.其他\_\_\_\_\_(請說明)。
- 6-9.加入**前後**都將稻米賣到: ☐1.繳公糧 ☐2.民糧 ☐3.其他\_\_\_\_\_(請說明)。
- 6-10.您覺得您會因為此試辦計畫而改變您販售水稻的管道嗎?  
☐1.會 ☐2.不會 ☐3.不一定

## 二、 種植及土地資訊(請填寫或在適當的□內打勾)

7. 請問您目前有在耕作的農地面積約有多大? 約有\_\_\_\_\_分地。
8. 請問您目前是否有跟別人租賃農地?  
☐1.有 ☐2.沒有(請跳答第 10 題)
- 9-1.請問您目前跟別人租賃的農地面積約有多大? \_\_\_\_\_ 分地。
- 9-2.請問今年租金大約多少? \_\_\_\_\_元/一分地/一年
10. 請問您過去一年內您經營的土地總共種過那些作物(請全部列出)  
\_\_\_\_\_(請說明)。
11. 請問您今年種的水稻田面積多大? \_\_\_\_\_分地。
12. 請問您今年種的水稻有哪些種類跟品種?(可複選)
- |   |   |
|---|---|
| <input type="checkbox"/> 1.稈稻; 品種:_____ | <input type="checkbox"/> 3.圓糯; 品種:_____ |
| <input type="checkbox"/> 2.私稻; 品種:_____ | <input type="checkbox"/> 4.長糯; 品種:_____ |
- 12-1.請問您一般將您的水稻賣去哪裡?  
☐1.繳公糧 ☐2.非公糧\_\_\_\_\_(如賣去很多地方請全部列出)。
13. 請問您水稻種苗的來源是?  
☐1.水稻育苗場 ☐2.自行育苗 ☐3.其他來源; \_\_\_\_\_(請說明)。
14. 請問您種植水稻的時間有多久? \_\_\_\_\_年。

15. 請問您知道您種植一分地的水稻成本大約多少錢呢(平均)?  
☐1.知道 新台幣\_\_\_\_\_元 ☐2.不知道
16. 請問您平常怎麼估計種植成本的呢?(請依據實際簡答,例如插秧、打田...  
如不知道怎麼回答,請略過此題不答)
- \_\_\_\_\_。

三、 田間人力(請填寫或在適當的☐內打勾)

17. 請問您農業主要經營型態為? ☐1. 專業農民 ☐2. 兼業農民
18. 請問還有其他人與您一起參與經營農地嗎?(複選)  
☐1.固定工 ☐2.臨時工 ☐3.家人 ☐4.沒有,我經營的農地都是我一個人  
做

四、 背景資料(請填寫或在適當的☐內打勾)

19. 請問您去年家庭收入每戶所得總額按農業收入與非農業收入來源大約是多  
少呢?  
農業收入佔全年收入\_\_\_\_\_%; 非農業收入佔全年收入\_\_\_\_\_%
- 19-1.請問您過去一年所領的農業補助總收入大約佔去年一年家庭收入比例?  
大約\_\_\_\_\_%
- 20.請問您以及目前一起居住的家人人數合計共:\_\_\_\_\_人。
- 20-1.請問您家裡目前的居住成員有:\_\_\_\_\_ (請說  
明)。
21. 請問您的性別是:☐男 ☐女
22. 請問您的年齡: \_\_\_\_\_歲
23. 請問您居住地的郵遞區號: \_\_\_\_\_
24. 請問您的最高學歷是: \_\_\_\_\_
25. 請問您是否是水稻產銷班的成員? ☐是 ☐否

~~~~~問卷到此結束,非常感謝您的填答~~~~~