Farmers' acceptability of hybrid rice in Brgy. Ruparan, Digos City

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ABSTRACT

The study determines the socio-demographic, farming characteristics, and farming inputs of hybrid rice technology farmers in Ruparan, Digos City, as well as the willingness-to-accept of farmers and the substantial dynamics that significantly influenced farmer's hybrid rice technology. The use of the non-experimental descriptive-causative method is distinguished and the factors that may link to the livelihood of adopting hybrid rice technology. The gathered data were taken from 50 respondents/farmers through a household survey. The Probit model was utilized to determine which of the farmers' socio-demographic willingness to adopt hybrid rice technology. Results revealed that, on average, hybrid rice farmers are 48.05years old, mostly females, and are prominently married, with educational attainment of 9.45 years and a household size of 4.13. The harmers who intend to adopt hybrid rice technology have a farm size of 5.65 hectares. The seeds of the farmers who intend to adopt the average expenses are Php 4,627.90 per hectare. The average expenses for fertilizer of the farmers who intend to adopt have an average expense of Php 17,684.00 per hectare while employing at least seven helpers on the farm. Probit analysis revealed that age and access to credit were significant factors that determine willingness to accept hybrid rice technology.

Keywords: *hybrid rice, farmer`s acceptability, descriptive – causative, Philippines*

INTRODUCTION

Rice is one of the most widely grown crops globally, providing food for half of the world's population. In all of Asia, rice is the staple food grain, accounting for approximately 30% of daily caloric intake. Additionally, more than 140 million rice-farming households rely on rice as their primary livelihood source. Asia contributes up to 88% and 91% of the world's rice area and production, respectively. From the start of the 21st century to date, rice production in Asia has increased unceasingly to obtain additional 130 million tons or 10 million tons per year. Therefore, rice plays a central role in the food and livelihood security of millions of households across Asia through both cultivation and consumption.

Despite those significant achievements in rice production attained in Asia during the last ten years, several challenges and uncertainties have been foreseen to affect rice production adversely in the years to come, including, high incidence of hunger and poverty in the region, shrinkage of essential resources for rice production such as land, water, and labor, increase of population and food demand, declined trend in rice productivity growth, environmental degradation caused by mismanagement of agronomic practices in rice production; and, effects of climate change according to (Ghorban 2012).

In the face of all these challenges, several new opportunities have emerged to support the rice sector's sustainable development in the years to come. These opportunities could be enumerated as strong commitments of the world community to eliminate hunger and poverty in the post-2015 Development Agenda, fast development in technological innovations in agriculture crops, particularly rice, concerted efforts and commitments at global and country levels to cope with climate change on agriculture; and, a transformation of the rice sector in many rice-growing countries stated by (Mayer 2014).

The promotion of hybrid rice has been the centerpiece of the Arroyo administration's (GMA) rice production program in the Philippines during her presidency. The government's effort is to encourage hybrid seed production and adoption by farmers began in 1998. These early efforts focused on intensified research, short-term and season-long training programs on hybrid seed production, and large-scale technology demonstrations in 11 top rice-growing provinces. Despite no clear evidence that the hybrid rice technology was profitable than the best available inbreeds at the farm level or that a hybrid rice seed industry would be commercially viable, the government embarked on a nationwide Hybrid Rice Commercialization Program (HRCP). Thus far, the

program has relied mainly on massive subsidies to promote hybrid seed production and farmers' adoption. Most local government agricultural staff in rice areas were mobilized to promote and distribute hybrid seeds (Okyere et al. 2011).

In some provinces, the Local Government Units (LGU), specifically in Davao del Sur, encourages farmers to plant hybrid rice as their farming priority. At present, DA promotes the hybrid rice farming system and the OPAG mandate of provincial agriculture. They have the basis on how farmers maintain their livelihood, especially in farming using technology and resistance to change (Rao 2007). One of the rural areas located in Davao del Sur at Brgy. Ruparan, Digos City, Farmers typically grow hybrid rice, where the areas have better production environments in terms of water control, topography, soil conditions, and accessibility in the presence of easy communication towards the nearest town/city. They also tend to apply more fertilizers, agricultural chemicals, and labor inputs on hybrid seeds.

METHOD

The research design used in this study was the descriptive-causative design. According to Hall et al. (2009), a cross-sectional research design has three distinctive features: no time dimension, reliance on existing differences rather than change following an intervention, and a group are selected based on existing differences rather than random allocation. A cross-sectional design was used in this study because it focuses on finding relationships between variables at one moment in time. It was applied in the study using quantitative data via survey techniques to collect data.

Barangay Ruparan is one of the twenty-six barangays in Digos City. The majority of the people of this barangay are farmers. They planted hybrid rice and different varieties using the sampling technique, specifically random sampling; the researchers were able to select 50 farmers to answer the researchers' questionnaires. These respondents came/were selected from different parks/sitios in Barangay Ruparan to participate and use them to assess and interpret data in farming a different kind of rice seeds.

The researchers used survey questionnaires to gather data. The survey questionnaire is composed of four (4) parts. Part I focus on the respondents' profile (or the farmers willing to accept HBT) in terms of age, sex, marital status, household size, years in school, and Part II tackles the characteristics of farming which are in terms of years of experiencing in farming, several seminars/training

Table 1. *Distribution of respondents*

Variety of rice	Price by sack	No. of sacks	Percentage
Tonner rice	1,500	18,600	50
F1 rice	1,800	12,100	30
Diamond rice	2,000	15,200	20
TOTAL	5,300	45,900	100

attended in rice farming, a distance of farm of the nearest market, member of a cooperative, and access to credit. Part III entails the farmer's inputs regarding how big of farms, how much they spend on seeds during planting season, how much they spend on fertilizer per planting season, and how many workers they employ per planting and harvesting season. Lastly, Part IV contains information on the willingness to pay for hybrid rice technology in Ruparan, Digos City. These survey questionnaires were taken from the sample thesis aligned with this study. The study stressed farmer's acceptability of hybrid rice farming in Brgy. Ruparan, Digos City.

Descriptive statistics were used to determine the farmers' acceptability of hybrid rice farming and the willingness to accept (WTA) for Hybrid Rice Technology (HRT). Moreover, Probit (Probability unit) model was used to determine the variables that significantly predict the willingness-to-accept to hybrid rice technology. In probability theory and statistics, the probit function is the quantile function associated with the standard normal distribution, commonly denoted as N (0,1). Mathematically, it is the inverse of the cumulative distribution function of the standard normal distribution, which is denoted as $\Phi(z)$, so the probit is denoted as Φ-1(p). It has applications in exploratory and specialized regression modeling of binary response variables largely because of the central limit theorem, the standard normal distribution plays a fundamental role in probability theory and statistics. If we consider the familiar fact that the standard normal distribution places 95% of probability between −1.96 and 1.96 and is symmetric around zero. It follows that Φ (-1.96) =0.025=1- Φ (1.96). The probit function gives the 'inverse' computation, generating a value of an N (0,1) random variable associated with specified cumulative probability. Continuing the example, probit (0.025) = -1.96= -probit (0.975). In general, Φ (probit (p)) = and probit (Φ(z)) = z.

RESULTS AND DISCUSSIONS

Characteristics of Rice Farmers in Brgy. Ruparan

It is shown in Table 2 that the average age for farmers who expressed non-adoption of hybrid rice technology is 53.92 years old, while those who intend to adopt have an average age of 48.05 years. The average age for all the farmers is 49.46 years old. The result is tangent to the findings of Mcbride and Daberkow (2008), Ayamga et al. (2006), Gamba et al. (2006), and Asante et al. (2011), which bannered that age is used as a proxy for rice cultivation in which age and WTA are positive but reversed in a later part of their life (age).

The average household size for farmers who expressed non-adoption of hybrid rice technology is 4.08, while those who intend to adopt has an average household size of 4.13. The average household size for all the farmers is 4.12 years old. The findings are congruent to the work of De Jan (2007), as the size of a household is 4.08 (which is an average number of family sizes in a typical Filipino family), who excavated that larger household will influence the decision of acceptance because of the availability of labor required during the adoption process.

Table 2. *Percentage of Adopters and Non-Adopters of Hybrid Rice Technology*

Variables	Non-Adopters		Adopters		Total	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Age	53.91	13.72	48.05	13.33	49.46	13.52
Household	4.08	2.78	4.13	1.80	4.12	2.05
School	7.08	3.45	9.45	3.24	8.88	3.41
Years in Farming	14.08	11.20	16.89	11.93	16.22	11.71
Seminars	3.50	2.47	3.21	2.83	3.28	2.73
Farm Size	12.78	33.94	5.65	12.06	7.36	19.44
Seeds	6,937.50	7985.87	4,627.90	7,132.15	5,182.2	7329.37
Fertilizer	21,008	14758.69	17,684	16141.54	18,482.00	15738.37
Workers	8.67	8.70	7.16	5.51	7.52	6.35

The average years of education received by farmers who expressed non-adoption of hybrid rice technology are 7.08, while those who intend to adopt has an average of 9.45 years. The average number of years of education received by all the farmers is 8.88 years old. The result suggests that the average years of education to those who intend to adopt is equivalent to a third-year secondary level (9.45). Simultaneously, the non-adopters are equivalent to a first-year secondary level (7.08). This is found in the same vein with Dos and Norris (2007) findings, who

implied that there are a higher understanding and managing of unfamiliar technology to those who acquire higher formal education.

The average farm size of the farmers who expressed non-adoption of hybrid rice technology is 12.79 hectares, while those who intend to adopt have an average farm size of 5.65 hectares. The average farm size of all the farmers is 7.36 hectares. This finding is parallel to the postulation of Eastwood, Lipton, and Newell (2010), who bannered that there are possibly dimensioned in rice family and that the scale of production depends on the farm size.

The average expenses for the farmers who expressed non-adoption of hybrid rice technology are Php 6,937.50, while those who intend to adopt have an average expense of Php 4,627.90 hectares. The average expense for seeds spent by all the farmers is Php 5,182.20. Lower adoption of hybrid rice technology, as explained in the average expense of those who intend to adopt (Php 4,627.90), connotes the unequal compensation for the higher cost of seeds. This is parallel to David's (2006) findings, who figured that even the government had exerted too much effort to promote hybrid rice technology, farmers do not find it economically viable in their part because of its cost, labor, and other inputs required.

The average expenses for fertilizer of the farmers who expressed non-adoption of hybrid rice technology is Php 21,008.00, while those who intend to adopt have an average expense of Php 17,684.00 hectares. The average expense for fertilizer spent by all the farmers is Php 18,482.00. The result was congruent to the results of David's (2006) study that the expense on seeds and fertilizer is not economically feasible on their part with regards to costing and other inputs add-ups.

The average number of helpers employed by farmers who expressed non-adoption of hybrid rice technology is 8.67 helpers, while those who intend to adopt employed an average of 7.16 helpers. The average number of helpers employed by all the farmers is 7.52 helpers. The findings connoted that those who are willing to adopt hybrid rice technology have fewer employed helpers on the farm.

Socio-Demographic Profile of Hybrid Rice Technology

It is also presented in Table 3 regarding the socio-demographic profile. Meanwhile, 56% of the farmers are females, while 44% are males. This can be attributed to the fact that the females are either left behind by the death of their

spouses and are left behind until the farm, are considered to be the head of the family or have cultivated the land by choice.

Table 3. *Socio-Demographic Profile of Acceptability of Hybrid Rice Technology*

Variables	Frequency	Percentage
Sex		
Male	22	44.0
Female	28	56.0
Marital Status		
Single	2	4.0
Married	48	96.0
Membership in a Cooperative		
Yes	44	88.0
No	6	12.0
Access to Credit		
Yes	33	66.0
No	17	34.0

In terms of marital status, 96% of the respondent farmers are married, while the remaining 4% are single. Typically, rice farmers in Ruparan are married based on the local Department of Agriculture Office's records.

Additionally, 88% of the farmers responded that they are cooperative members. This punctuates that the farmers are members of a common organization that seeks to educate them with the right farming methodologies and become the venue for them to ask assistance and seek help in their farming practices. The findings suggested that most farmers are members of a cooperative. This is parallel to the notion of Ironkwe (2005) that proclaimed membership of farmers in a cooperative is associated with increased technology utilization.

Lastly, 66% of the farmers declared that they have access to credit. This access includes the association of farmers who extend help to their fellow farmers for support and financing for their products. They pay either in installments or the moment harvest season comes around. The findings implied that most of the farmers are attached to credit unions. This is basically for financial considerations. The findings are parallel to Coetzee's (2007), work who strummed that credit programs and combined individual and group utilization acknowledges the context of technology application.

Lastly, presented in Table 4 shows the farmers' willingness to pay for hybrid rice technology presented on average. Farmers who expressed non-adoption of hybrid rice technology revealed that they would not spend a thing for hybrid rice technology. At the same time, those who intend to adopt are willing to pay an average of Php 34,534.00 for hybrid rice technology. All in all, the farmers in Ruparan have an average WTP for hybrid rice technology of about Php 26,246.00.

Table 4. *The willingness of Farmers to Pay Hybrid Rice Technology*

Variables	Non- Adopters		Adopters		Total	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
WTP	0	0	34,534	49034.667	26,246.00	45139.097

Acceptability of Hybrid Rice Farming in Brgy. Ruparan

This section discusses the outcome of the hybrid rice willingness to accept hybrid rice technology based on the survey. Table 5 shows the Frequencies and Percentage of Adoption of Farmers Towards Hybrid Rice Technology; farmers who will adopt hybrid rice technology in terms of frequency have 38 out of 50 frequency respondents, while the farmers who will not adopt hybrid rice technology have a frequency of 12 out of 50 respondents.

Table 5. *Frequencies and Percentage of Adoption of Farmers Towards Hybrid Rice Technology*

Rate of Adoption	Frequency	Percentage
Will Adopt	38	76.00
Will Not Adopt	12	24.00
TOTAL	50	100.00

According to Cobb-Douglas production theory, average monetary for the inclination to accept for hybrid rice is also presented in Table 5 the relative distribution of farmers who adopt and those who do not adopt hybrid rice technology. Results revealed that the adoption rate of hybrid rice technology based on the number of farmers who expressed willingness to adopt in terms of percentage has 76% out of 100%. The remaining is 24% out of 100%; the farmers expressed non-adoption of hybrid rice technology.

Factors that Influence Adoption of Hybrid Rice Technology

Table 6 shows the data on factors to consider the farmer's willingness to accept hybrid rice technology. Age was a significant factor that determines willingness to accept hybrid rice technology. It yielded a coefficient value of -0.0612339 with a p-value of 0.07381, which is significant at a 90% confidence level. The negative sign of the coefficient indicates that the higher the farmer's age, the lesser tendency they will accept hybrid rice technology. Note the difference between the farmers who will adopt the hybrid rice technology (x_age = 48.0526 years old) than those who would not accept (x_age = 53.9167). It is supported by Feder et al. (2006), who expounded that the age of the farmer implies farming experience and knowledge gained over time and play an integral role in evaluating technology information and attributes. Older farmers are expected to use their gained farming experience to adopt the carbon tree trade initiative.

In contrast, younger farmers have longer planning horizons and are likely to invest more in the project initiative. The role of gender in Kenya and the Sub-Saharan region, in general, is widely recognized, where it is estimated that women supply the agricultural sector with 70-75% of the labor force. Compared to men, women lack access and control over vital production resources such as land, information, credit, and labor (Njeri, 2007). Thus, it is expected that male-headed household would likely adopt the Carbon tree project on their farm because of control over vital farm resources

Access to credit was also a significant factor determining willingness to accept hybrid rice technology. It yielded a coefficient value of -1.52465 with a p-value of 0.02955, which is significant at 95% confidence level. The positive sign of the coefficient indicates that the more access to credit there is for the farmers, the higher the tendency to accept hybrid rice technology.

It is supported by Roger (2006), stating that credit availment and family income per cropping exhibits negative coefficients and are significant at a 5% level of confidence. These results imply that as credit availed increases, the farmer's probability of adopting organic techniques decreases. Age is positively related to the rate of adoption. Contrary to what stated, young farmers are more willing to adopt an innovation than an elder one because they are more open. However, in this study, older farmers became more open to changes. Credit is one of the most significant capital accumulation bases and may be viewed as a device for facilitating the temporary transfer of purchasing power from one individual or organization to another. It provides the basis for increased production efficiency

through a specialization function. Kimemia (2006) also added that access to credit is regarded as one of the key elements in raising agricultural productivity DBSA (2005).

Table 6. *Factors to Consider the Farmers Willingness to Accept Hybrid Rice Technology*

Predictors	Coefficient	Std. Error	*Z*	p-value	Remarks
(Intercept)	15.0004	6718.74	0.0022	0.99822	
Age	**-0.0612339**	**0.0342506**	**-1.787**	**0.07381***	**Significant at 90%**
Sex	-0.973739	0.606676	-1.605	0.10848	NS
Marital Status	-5.82793	3359.37	-0.001	0.99862	NS
Household	-0.208388	0.134635	-1.547	0.12167	NS
School	0.115304	0.126366	0.912	0.36153	NS
Years of Farming	0.0372723	0.0267325	1.394	0.16324	NS
Seminars	-0.0928016	0.125243	-0.741	0.45871	NS
Cooperative Membership	1.00349	0.933584	1.075	0.28243	NS
Access to Credit	**1.52465**	**0.700631**	**2.176**	**0.02955****	**Significant at 95%**
Farm Size	-0.0154002	0.0128272	-1.201	0.22991	NS
Seeds	-6.70887e-05	5.40298e-05	-1.242	0.21435	NS
Fertilizer	5.75409e-06	2.2473e-05	0.256	0.79792	NS
Workers	0.0233097	0.0550303	0.424	0.67187	NS

*** Estimations using Probit analysis

CONCLUSIONS AND RECOMMENDATIONS

The interviewed rice farm owners ages between 18-83 years old, majority of them are females, married and a member of a cooperative and mostly had accessed to credit. The rice farm owners – respondents were found to have educational attainment, as expressed in the number of years of schooling ranging from 0 to 17 years, with an ideal household size on the average of 4.12 or four members. The

willingness to pay was found on the average of Php 26,246.00. Most of the farmers are willing to adopt hybrid rice technology. Two important variables/factors significantly predict consumers' willingness-to-adopt to hybrid rice, including age and access to credit. The higher the farmer's age, the lesser odds they will adopt hybrid rice technology. Meanwhile, the more accessible the credit sources are to the farmers, the higher odds they will adopt hybrid rice technology.

Since there are only two factors that are found to be significant predictors of farmers' willingness-to-accept (WTA) for hybrid rice technology, young farmers can able to make or produce quickly and confidently farming efforts and focus programs on the lower age that significantly determines farmers willing to accept hybrid rice technology. The Department of Agriculture should encourage the old farmers to continue access credit to remain their rice farming for the consumers. The government should subsidize or help someone by giving credit to increase capitalization. Farmers should plant carefully well-detailed farming techniques and strategies to increase the demand for hybrid rice and the willingness to accept hybrid rice technology. Future researchers who are aligned with this investigation about WTA for hybrid rice technology are encouraged using different statistical methods.

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