Socioeconomic Evaluation of Hybrid Rice Production in the Philippines

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Abstract

This study analyzed the changes in profitability, productivity and farm management practices of hybrid rice cultivation in comparison with inbred rice production. It also gave insights on factors affecting the adoption of hybrid rice technology. Data from five major rice-producing provinces, which include Nueva Ecija, Isabela, Iloilo, Davao del Sur and Davao del Norte, were processed using farm budget and regression analyses.

Results showed that the yield of hybrid rice production is higher than inbred production and that hybrid rice faces higher price in the market in comparison with its inbred counterpart. This led to higher gross income from hybrid rice farming. However, the hybrid rice cost of production is significantly higher due to higher seed, fertilizer, pesticide and hired labor cost. Because of these offsetting factors, net profit from the two types of rice farming did not differ significantly. In addition, analysis of actual input usage revealed that hybrid rice cultivation used more organic and inorganic fertilizers, pesticides, and hired labor inputs. The factors that were found to influence the probability of continuous adoption include: yield, price of rough rice, price of seed, pesticide cost, labor wage rate, education level of farmers, the availability of credit, and provincial location of farms.

Key words

Profitability, productivity, adoption, farm-budget, regression, rice

Media Summary

The shift from inbred to hybrid rice technology indicate higher yield and fetches higher market price but faces bigger production cost in major Philippine rice-producing provinces.

Introduction

The Philippine government launched a Hybrid Rice Commercialization Program (HRCP) in 2002. It promotes the large-scale use of hybrid rice technology to increase the production capacity of the country and thereby achieve rice self-sufficiency. The program also envisions improvement in farm income, decline in poverty incidence, and stimulation of employment in the rural sector through the use of this technology. The HRCP has several components such as seed production, procurement and distribution, seed subsidy to farmers, intensive promotions, training, and technical assistance to both hybrid seed and commercial rice growers. The program initially targeted 50,000 ha to be planted with hybrid rice in 2002, which is expected to increase to 300,000 ha by 2004 (Sana et al, 2002).

Given the scope of the program, this paper will analyze the dynamics of hybrid rice adoption and evaluate its farm level performance against the use of inbred rice technology. This study will examine specifically the differences in productivity, and profitability of hybrid and inbred rice farming, and determine the factors that affect hybrid rice adoption.

Methods

About 211 rice cultivators using hybrid varieties and 234 rice cultivators using inbred varieties from Nueva Ecija, Isabela, Iloilo, Davao del Sur, and Davao del Norte, were interviewed during the 2002 wet season. Farm-level data on socioeconomic characteristics, farm and farming profiles, as well as details of output, input usage, and costs of production were obtained through a survey questionnaire using a stratified random sampling technique. Data were processed using an integrated approach. Measures of central tendency were used to evaluate and compare the performances of inbred and hybrid rice production. An unpaired t-test was used to determine whether the difference between the means was significant. In addition, farm budget analysis techniques were used to assess the relative profitability of the two types of rice production.

Finally, the farmer's decision to continue the use of hybrid rice was analyzed using a logistic regression model. In this process, the decision to use hybrid rice technology for the succeeding season was modeled as a binary response. This was then regressed against factors that might affect the adoption decision. Among these variables are education, attendance to a hybrid rice production training, credit availability, and provincial location, total rice area cultivated, prices of output and inputs, and non-agriculture income. The estimated coefficients were interpreted as the change in log-odds ratio in favor of adoption per unit change in the particular explanatory variable while the sign of the coefficients will indicate the direction of change (Casiwan et al, 2003, and Hidalgo, 2001).

Results and Discussions

Figure 1 shows that hybrid yields differ across location. Hybrid yield is significantly higher in Isabela, Davao del Sur and Davao del Norte, while it is significantly lower in Nueva Ecija. On the other hand, no significant difference in the yield of hybrid and inbred varieties was observed in Iloilo. On the average, hybrid rice yield is greater than inbred by 10%.

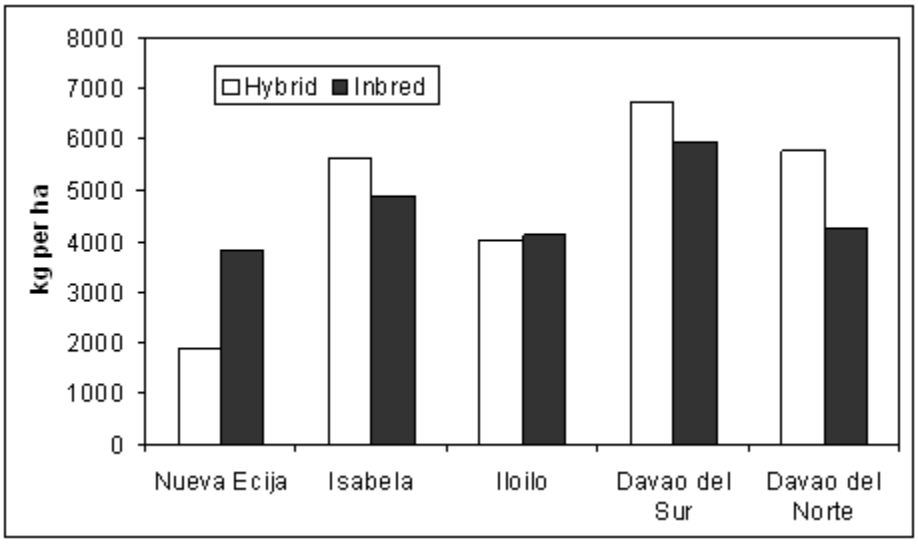

Figure 1. Yield performance of hybrid and inbred rice production across location, WS 2002

Table 1 shows that the area devoted to hybrid rice is smaller than inbred although hybrid farmers have larger landholdings than inbred farmers. In terms of farm inputs, hybrid rice cultivators have used more fertilizers (both organic and inorganic), pesticides and hired labor than their inbred counterparts. On the other hand, average quantity of seed used is significantly lower in hybrid.

Figure 2 shows the gross return from hybrid rice production (US$763[1]) is significantly higher than inbred (US$664) by 15% due to higher yield and price faced by hybrid rice in the market. Hybrid rice production cost is higher than inbred by US$82 per ha because of larger seed, fertilizer, pesticide and hired labor costs. Due to this, net income from hybrid rice production is higher by only 8% than inbred, which is not

significant from the statistical point of view. Even the benefit-cost ratio of the two types of production (1.41 for hybrid vs. 1.45 for inbred) did not differ significantly.

Table 1. Yield and Input Use of Hybrid and Inbred Cultivation, WS 2002

Item	Inbred (n=211)	Hybrid (n=191)	
Yield	4589	5041	**
Area	1.75	1.37	**
Seed	108	24	***
Inorganic Fertilizer			
N	99	123	***
P	30	40	***
K	22	36	***
Organic Fertilizer	31	231	***
Total Labor	74	125	***
Hired Labor	54	104	***
Imputed Labor	20	21	
Chemicals	1.02	1.30	***

Note: *** - significant at 1%; ** - significant at 5%; * - significant at 10%

Results of the estimated logit model shows that the factors affecting the decision to plant hybrid rice in the succeeding season are yield, price of paddy, price of seed, wage rate of labor, pesticide cost, and dummy variables for education, credit, training on hybrid rice production, Isabela, and Davao del Sur (Table 2). The positive signs of yield and paddy price indicated that the higher these variables, the greater the probability that farmers will continue use hybrid due to higher expected income.

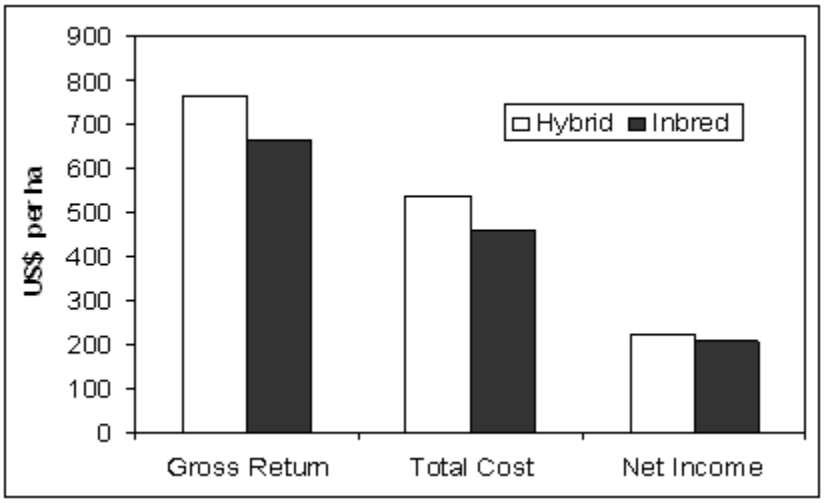

Figure 2. Production cost and net income from hybrid and inbred rice production, WS 2002, Philippines

On the other hand, the negative signs of wage rate of labor and pesticide costs demonstrate that the lower values of these variables are, the greater probability that farmers will continue adopting hybrid rice. This is because the lower values of these variables would entail lower production cost, and thereby larger profit. However, it is interesting to note that the result is contrary to the notion that high price of hybrid seed is deterrent to its continuous adoption. Findings show that the higher price of seed faced by the farmers in the initial season the higher the probability that they will plant in the succeeding season. This could be explained by farmers' perception that high seed price is associated with quality, which thereby leads to higher yield.

Among the social variables, it was found that farmers with at least secondary level of education have greater probability of hybrid rice continuous adoption. It was also noted that farmers who borrow capital

are found to be more likely to plant again because of the credit program offered by the HRCP. It is also important to note that attendance to the hybrid rice technical briefing is a major determinant of continuous hybrid rice adoption. Finally, apparent suitability of Isabela and Davao del Sur to hybrid rice cultivation makes it more probable for farmers in these provinces to continuously adopt hybrid rice in comparison with other provinces.

Conclusion

The yield of hybrid rice is superior to inbred but research and development is needed to stabilize the yield advantage across location. The cost of producing hybrid rice could be reduced by increasing fertilizer and pesticide-use efficiency, and improved labor productivity. In addition to the yield advantage and a reduction in production costs, gross income from hybrid rice could be increased through higher prices of rough rice, which could be achieved through breeding of high eating quality hybrid rice varieties. On the other hand, the adoption of hybrid rice could be hastened through demonstrating its economic superiority either by yield advantage, increased price of rough rice, or reduction in production cost. The high cost of hybrid seed is not a deterrent in its continuous adoption as long as farmers have already seen its superior performance. Finally, the extension of public services such as credit and training will help in the continuous adoption of hybrid rice.

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[1] This used an exchange rate of 55 Philippine peso per US dollar.