ECONOMIC ANALYSIS OF HYBRID AND CONVENTIONAL VARIETIES OF RICE: A CASE STUDY OF TEHSIL BHOWANA OF DISTRICT CHINIOT

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ABSTRACT: High yielding varieties were introduced to overcome the problem of food insecurity. Net returns of hybrid and conventional varieties of rice were analyzed in the present study. The sample size of 120 respondents from farming community of tehsil Bhowana was selected to get information. The gross returns per acre for hybrid, basmati and irri rice were calculated to be 77973.97, 55602.15 and 49077.23 rupees respectively. The total costs per acre for hybrid, basmati and irri rice were calculated to be 48506.34, 39391.87 and 37394.97 rupees respectively. The net returns per acre for hybrid, basmati and irri rice were 29467.63, 16210.28 and 11682.26 rupees respectively. The average value of rice varietal diversity index for small, medium and large farmers was estimated to be 0.2172, 0.3943 and 0.5589 respectively. Government and policy maker should start some programs for training of farmers, in selected areas. The model plots should be introduced and on those plots state of art technologies and skills should be employed practically.

Key words: Hybrid Rice, Basmati Rice, Conventional Varieties, Net Returns, Rice Varietal Diversity Index.

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INTRODUCTION

Rice is the staple food of more than fifty percent of population in the world. It is a leading nutritive energy source for seventeen states in Asia and the pacific, nine states in North and South America and eight states in Africa. The rice produced in Pakistan has good quality and attributes that makes it unique in the whole world.Pakistan produces rice sufficiently to meet the local need and to export it to other countries. In the past few years, the export of rice has become major source of earning foreign exchange for Pakistan. The share of rice for value addition in agriculture and GDP is 2.7% and 0.6% respectively. The production of rice during 2012-13 was5541 thousand tons and percent decline in the production during that year was -10% respectively. The yield during 2012-13 was 2311 kgs per hec and percent fall in yield was -0.1% in that period. The area under cultivation during year 2012-13 was 2311 thousand hectare (GOP, 2013).

The profitability of producers generally relies on yield and quality of grain. Traditionally plant breeders are concentrating on breeding for high yield while focusing on pest and disease resistance along with tolerance to unfavorable environmental conditions (Aslam *et al.*, 2012).

High yielding varieties are introduced to overcome the problem of food insecurity. Agricultural scientists are introducing new varieties that perform better than other conventional varieties. In the year 1976, China cultivated first commercial Hybrid rice (Jumin *et al.*, 2000).

When the cereal prices started to rise in 2007 with peak in 2008, then many rice farmers shifted to hybrid of all other such kinds of seeds. Since the hybrid seed yields up to three times of traditional varieties, many sugarcane and other crop's growers also made the shift. No government agency discouraged the trend and it gained momentum over a period of two years.

In recent times, hybrid rice is the only emergent technology available to raise the ceiling of rice yield potential by 15-20 percent. Hybrid rice is grown on 17 million hectares of land and accounts for more than 50 percent of the total rice area in China. It has helped this country to produce additional 300 million tons of rice since 1976 and has saved more than 2 million hectares for agricultural diversification. This was achieved due to the fact that the yield of hybrid rice is more than 20 percent (or 1 to 2 tons/hectares) which is higher than that of conventional varieties. This technology is very essential for highly populated areas, where arable lands are limited (Yuan and Fu, 1995).

The motivation to farmers for selecting variety and crop choice has been influenced by many factors. These factors are market orientation, income diversification, variability of resources, education level, labor type and its availability, grower's own liking, wealth, risk aversion, availability of inputs, and prices of outputs. These economic factors have influence on decision making behaviors of farmers to adopt a specific crop and variety (Smale *et al.*, 2001).

For a proper price policy for rice or any other product, sufficient knowledge of cost of production is one of essential prerequisites. Keeping this in view, the cost

of production of hybrid and conventional varieties would be a plausible milestone. This study provided a base for price policy formulation and further more would be helpful in assuring proper return to growers.

MATERIALS AND METHODS

The universe consisted of respondents from farming community of tehsil Bhowana of district Chiniot. Farmers with land holding of less than 12.5 acres were treated as small farmers while those between 12.5 and 25 acres were treated as medium farmers and above 25 acres were considered as big farmers. The representative sample size of 120 farmers was selected and 10 villages of tehsil Bhowana (12 farmers from each village) were selected randomly. The data was collected through a farm level survey of the target area using a pre-designed, pretested questionnaire for cropping year 2012. In order to compare net return per acre of hybrid and conventional varieties of rice, information like input use, labor employed, cultural practices and capital investment were part of questionnaire. Similarly, information about number and types of rice varieties grown, soil type and associated socio-economic and demographic characteristics were included.

Rice varietal diversity index (VDI) was measured by using the following formula:

$$\mathbf{VDI_j = 1-\sum_j (a_{ij}/A_i)^2}$$

The index could range from 0 to 1, zero indicated no rice varietal diversity and 1 indicated very high rice varietal diversity for a farmer (Smale *et al.*, 2001; Joshi *et al.*, 2006; Muttaleb *et al.*, 2008).

Model specification: Multiple linear regression model was $\mathbf{Y} = \alpha_0 + \sum_{i=1}^{n} \beta_i X_i + \mu_i$ was developed for estimation of Varietal Diversity Index. The independent variables included in model were land holding, number of animals, labor availability, education, profitability and investment. The dependent variable in the model was rice varietal diversity index.

RESULTS AND DISCUSSION

The gross returns per acre for hybrid, basmati and irri rice were calculated to be 77973.97, 55602.15 and 49077.23 rupees respectively (Table 1). It was clearly shown that gross returns for hybrid rice were much higher than basmati and irri rice varieties. The total cost per acre for hybrid, basmati and irri rice was calculated to be 48506.34, 39391.87 and 37394.97 rupees respectively. The net returns per acre for hybrid, basmati and irri rice were calculated to be 29467.63, 16210.28 and 11682.26 rupees respectively. These results were consistent with the findings of Khusik *et al.* (2011) and Azad (2008).

Rice Varietal Diversity: Out of 120 farmers, only 20 farmers had no rice varietal diversity at all and this category comprised of 16.66 percent (table 2).

Table 1. Gross Return per Acre, Total Cost and Net Return of Various Rice Varieties

Rice Variety	Gross Return	Total Cost	Net Return
Hybrid	77973.97	48506.34	29467.63
Basmati	55602.15	39391.87	16210.28
Irri	49077.23	37394.97	11682.26

Table 2. Distribution of Respondents by Rice Varietal Diversity Index

Rice varietal diversity categories (scores)	Diversity Index Range	Frequency	Percent
No rice varietal diversity	(0)	20	16.66
Low rice varietal diversity	(0.01-0.33)	32	26.66
Medium rice varietal diversity	(0.34-0.66)	64	53.33
High rice varietal diversity	(>0.66)	4	3.33
Total		120	100

While 26.66% farmers had low rice varietal diversity (0.01-0.33).About 53.33% farmers had medium rice varietal diversity (0.34-0.66). Out of 120 farmers, only 3.33% farmers had high rice varietal diversity (>0.66). These results are consistent with the results achieved by Muttaleb *et al.*(2008).

Rice Varietal Diversity Index: The average value of rice varietal diversity index for small farmers was estimated to be 0.2172. It showed that small farmer had low rice varietal diversity (0.01-0.33). The average value of rice varietal diversity index for medium farmers estimated was 0.3943 and this implied that medium farmers were found to have medium rice varietal diversity (0.34-0.66).

The average value of rice varietal diversity index for large farmers was estimated to be 0.5589. It showed that on the whole, larger farmers had medium rice varietal diversity (0.34-0.66). At the aggregate level, sample average value of rice varietal diversity index of

all the three categories was found to be 0.3901 (table 3). This indicated that rice farmers had medium rice varietal diversity in the study area. These results are in line with the results achieved by Muttaleb *et al.,* (2008), Bellon (1990).

Table 3. Average Rice Varietal Diversity Index

Rice Farmer Category	Average Rice Varietal Diversity Index
Small	0.2172
Medium	0.3943
Large	0.5589
Overall	0.3901

Econometric Analysis: Regression analysis was applied to estimate the effect of different variables on varietal diversity index (table 4).

The goodness of fit of the model was judged by the likelihood ratio (LR) test and R^2. The value of R^2 was 0.42 indicating about 42 percent of variation in VDI was explained by included explanatory variables. Coefficient of constant for estimates was 0.286 which showed significant difference at 5 percent level effect of independent variables was zero, variety diversity index was 0.286.

Land holding had significant impact on variety diversity. Coefficient of land holding was 0.190 which showed significant difference at 1 percent level of significance. One unit change in land holding caused 0.190 times change in variety diversity index. Similar results were also supported by Joshi (2006).

Table 4: Econometric Estimation of Varietal Diversity Index

Variables	Coefficients	Standard Error	T Statistics	Level of Significance
Intercept	0.286	0.139	2.058	0.0417
Land Holding	0.190	0.021	2.825	0.005
No. of Animals	0.038	0.014	1.647	0.102
Labor Availability	0.142	0.015	3.960	0.000
Education	0.023	0.054	0.426	0.670
Profitability	0.163	0.001	2.131	0.035
Investment	0.131	0.005	2.220	0.028
Soil Characteristics	0.014	.002	2.103	0.037
R^2		0.42		

The estimated coefficient of number of animals on farm was 0.038 which was statistically non-significant.

Coefficient of labor availability was 0.142 which was significant at 1 percent level. It showed that one percent change in labor availability caused 0.142 changes in value of varietal diversity index. When more labor was available, it induced the farmers to increase the area allocation to crop production (Benin *et al*., 2003).

The estimated coefficient of education was 0.023 which was statistically insignificant. The results of present research were consistent with study of Sikandar (2010).

The estimated coefficient of profitability was 0.163 which was statistically significant at 5 percent level. One percent change in profitability caused 0.163 times change in value of varietal diversity index. The farmers could grow a number of varieties to attain maximum profit by abating yield losses caused by biophysical Pressure (Kwikiriza, 2007).

Coefficient of investment was 0.131 at 5 percent level of significance; it showed that that 1 percent change in investment caused 0.131 changes in varietal diversity index. If the farmers had more investment, then they could have grown more number of varieties (Joshi and Bauer, 2006).

Coefficient of soil characteristics was found to be 0.014 at 5 percent level of significance; it indicated that 1 percent change in soil characteristics caused 0.014 times change in varietal diversity index. The positive and significant coefficient of soil characteristics indicated that farmers had planted more number of varieties with diverse environmental conditions (Gomez *et al*., 2000 and Mcafee, 2004).

Conclusion: The main reason to sow old seed given by farmer was that the new seed were more expensive than old ones. It was also observed that the new rice seed was imported by some local agents who sell their seeds at very high rate. So it is recommended to the policy makers to initialize some policies about seed import and their supply to farmers at lower cost. There should be establishment of the some committees at tehsil levels and duty roaster be specially designed to check the seed selling shops on regularly basis.

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