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An Economic Analysis of Rice Production in Pakistan: A Case Study

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Authors' contributions

This work was carried out in collaboration among all authors. Authors BB and SS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors BB, SS and BN managed the analyses of the study. Authors BB and SS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Rice is the second-largest crop in Pakistan as it contributes 1.3% share in the GDP of Pakistan. For the last couple of year's rice economy is caught up in a very complex situation. The present study was designed to find the yield gap, cost of production, technical efficiency and BCR (Benefit Cost Ratio) in rice production. To achieve the study objectives, data were collected from 150 respondents. These respondents were selected from eight villages of District Sheikhupura by using a purposive random sampling technique. Data were collected by using a well-developed and pre-tested questionnaire by conducting personnel interviews.
Results of descriptive analysis showed that the average farm size of the farmers was 14.85 acres. BCR (Benefit Cost Ratio) of fine and coarse rice varieties were 1.13 and 1.11, respectively. To Support rice production and to minimize the farmer's losses, the Government should announce the support price of rice. The cost of production can be reduced by imposing strict vigilance and control over the input supplier.

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1. INTRODUCTION

Agriculture is second largest source of the economy, so it plays a vital role in the economy of Pakistan. It consists of about 45 percent total labors of the country. It exhibits a vital role in GDP of Pakistan as it contributes about 19.8 percent in global domestic production of Pakistan. Agriculture products form 70 percent approximately in foreign exchange earnings and play a vital role in Pakistan. There are major crops in agriculture sector including wheat, cotton, rice and sugarcane. The production of these major crops has increased about 0.6% in the world during the year 2016, but in Pakistan, the production of these major crops decreased about 1.1 percent [1]. FAO estimates that production of rice had increased last year about 0.8 percent in the world. While main reasons for this low production in Pakistan are lack of investment including lack of provision of better infrastructure and including deficiency of new advanced technology. As cultivation of rice faces many challenges such as decline of water facility and other dramatic climatic changes. Hence economic growth of the country is positively affected with growth of agriculture [2].

In term of area of cultivation, rice plays a vital role as second largest important crop in foreign exchange earning along with cotton in Pakistan. Area of cultivation of major crop wheat, rice, cotton, sugarcane and maize are 9.19, 2.89, 2.8, 0.7 and 0.69 million hectares respectively. Pakistan plays a significant role as 4th largest country in rice production in the world. In Pakistan, rice contributes about 0.6 percent of total GDP while about 3.1 percent values added in agriculture sector [3]. About 89 percent of world's rice produced in Asian countries and China alone produced 55 percent of the world production of rice. In the world. Pakistan comes as the 4th largest exporter in rice production after India, Thailand and Vietnam [4]. During the year 2015-16, production of rice was 6.8 million tons and cultivated about 2.7 million-hectare area having 60.52 mounds yield per hectares. During July 2015-16, rice earning was about $ 1.667 billion. As production of rice has increased while yield remains low as compared excluding rest of the world. In Pakistan, rice is cultivated specifically in two provinces, Punjab and Sindh. In these two provinces of Pakistan, almost 92% of total rice is grown. Due to better climatic and agronomic conditions in Punjab, about 61% good quality rice is produced in Punjab. Similarly, in Sindh, production of rice is about 31 percent. It shows essential role in foreign exchange of Pakistan and almost 13 percent of total foreign exchange comes through exportation of rice in the country. Pakistan has essential role in total rice trade of the world amounting to about 1.3 percent [5].

In Pakistan, rice grows about 10% of total crop area and form 1.3 percent of total GDP and it has 4.9 % value added in agriculture. Pakistan is the eleventh largest country in the world for rice production. Pakistan grows the most famed varieties of rice like super kernel basmati, super basmati, IRRI 9, IRRI 6, PK- 385 basmati rice and Pk-198 basmati rice. In Pakistan, Punjab ranks 1st in rice production and contributes about 58%, Sindh rank 2nd and contributes 29% in rice production, Khyber Pakhtoon Khawan ranks 3rd and contributes about 10%, Baluchistan contributes 3% in production and rank 4th in total rice production in Pakistan [6]. Table 1 shows the area, production and rice yield.

Rice exports of Pakistan have declined due to less use of quality seed, the high cost of production, increase in competition with other countries and lack of branding. This calamity of rice affects our farmers and our economy very badly. Many factors like flood, unpredicted

Table 1. Area, production and yield of rice in Pakistan

Year	Area		Production		Yield	
	(000 Hectare)	% change	(000 Tons)	% change	(Kg/Hec.)	% change
2010-11	2,364	-	4,823	-	2,040	-
2011-12	2,572	8.7	6,161	27.7	2,397	17.6
2012-13	2,309	-10.3	5,537	-10.0	2,399	0.1
2013-14	2,790	209	6,799	22.7	2,438	16.2
2014-15	2,892	3.7	7,006	3.1	2,424	-0.6
2015-16	2,749	-4.9	6811	-2.8	2,480	2.5

Source: Pakistan Bureau of Statistics, GOP (2016)

weather conditions and price variations influence the farmers to adopt modern technologies such use of good quality seed and high efficient irrigation systems in Pakistan. Climate and environmental changes also have negative effects on the basmati rice processing [7].

This reduction of production also affects Pakistan's economy and reduces the export of rice in the international market. This study will identify the problems of these crises and also give some recommendations to policy makers to design suitable policies to stabilize the price of rice and reduce these crises of rice in national and international market and protect the farmers from losses.

1.1 Objectives

The main objectives of the present study are as follow:

- To assess the socio-economic physiognomies of rice producers.
- To estimate the profitability, cost of production, yield gap of rice and production efficiency.
- To explore major restriction in the rice grain production and its marketing.
- To suggest the appropriate policy recommendations.

2. METHODOLOGY

2.1 Study Area

The nature of the problem is worthy for more attention as a rice growing area of the Pakistan. However, due to some restriction like time and money the study is restricted to the eight prominent villages of district Sheikhupura.

2.2 Sampling

A sample was taken to collect the data from the population in the study area, however, to study the entire population was difficult task due to lack of sufficient resource i.e. limited duration of research time and expense. A simple random technique was used to draw sample size 150 respondents of rice growers in District Sheikhpura. Sample size is affected by three things: the level of variation in the population, the desired precision of the results, and the confidence level at which that precision calculated. Precision is the closeness of a sample estimate to the mean of the sampling distribution. This can be estimated from the normal distribution. The expression estimate should be correct within ±10%, with 95% confidence. The formula used by calculating sample size is:

$$N = z^2p\ (100\text{-}p)/x^2 = 1.96^2 11\ (100\text{-}11)/5^2 = 150$$

Where,

Z = confidence level at 95% and the value is 1.96
p = percentage or proportion
X = Accuracy

List of rice growing farmers was obtained through Govt. department of Agricultural Extension and Adaptive Research Wing Punjab Sheikhupura.

2.3 Preparation of Questionnaire

A well-prepared questionnaire set was used to collect the data and conduct interview from the respondents to accomplish study purpose. The mode of questionnaire was in English medium however, mother languages Punjabi and Urdu were used ask to inquire and gather data. Researcher completely explained the meaning of questions to the respondents to avoid any chance of miss understanding or miss interpretations before filling the draft to enhance the quality of research. After preparing the questionnaire pre-testing was done in study area from 10 respondents. After pre-testing, necessary changes were made in questionnaire to get better response the meaningful data.

2.4 Data Collection and Analysis

Data were collected through well-developed questionnaire after pretesting. A simple random sampling technique was used to collect the data from 150 respondent's farmers of rice growers on district Sheikhupura. With the help of descriptive statistics technique, data are interpreted, finding the mean value and frequencies needed for the analysis of the data using the software Statistical Package for the Social Sciences (SPSS).

2.5 Regression Model

Causal analysis is performed using log-linear model. For this purpose, the yield was the dependent variable while the land, sowing, irrigation, seed rate, fertilizers and chemical cost were independent variables used in this model.

$$LnY=\beta_0 + \beta_1X_1 - \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8$$

Where,

X_1 = Land holding size
X_2 = Sowing time
X_3 = No of cultivation
X_4 = Seed Rate
X_5 = No of irrigation
X_6 = Fertilizer
X_7 = Farm yard manure
X_8 = Chemical cost

2.6 Production Efficiency

The economic level at which an economy can no longer produce an additional unit of good without lowering the production level of another product is called production efficiency. In this study, Data Envelopment Analysis Technique (DEA) was used to measure technical efficiency of rice production in district Sheikhupura. This is the linear programming technique which used data regarding inputs and output for a best practice production frontier over the data point.

3. RESULTS AND DISCUSSION

3.1 Respondent's Age

Age is an important factor that affects the decision making ability of the farmers. It is assumed that young people work hard as compared to the old people and have more knowledge and education about farming as compared to old people. Young people have more risk taking ability as compared to older people. Age group of respondents was divided into three categories 40% (60 out of 150) of the respondents belonged to the first age group i.e. less than 40 years. While 37.3% (56 out of 150) respondents belong the age group greater than 40 years and less than 50 years. Also 22.7% (34 out of 150) of the respondents belong to the age group above 50 years in the age group.

3.2 Respondents Education

Education helps the respondent farmers for better understanding of the production process and also provides the opportunity to understand and adopt technological changes that are taking place in farming industry. Educated person knows about new technology, new seed varieties and new method of sowing. On the basis of education, respondents were divided into five groups. Results showed that 10.66% (16 persons out of 150) were lying in the first level of education which was above matric 37.34% (56 out of 150) of respondents was lying in the matric level education, 19.33% (29 out of 150) of the respondents was lying in the middle level education, 19.33% (29 out of 150) of the respondents belong to primary level education and illiterate respondents formed 13.34% (20 out of 150) they have no education in the study area.

3.3 Respondents Farm Size

Agricultural yield is directly linked with the size of farm; keeping in view the conditions should be favorable for crop production. There is a direct relationship between farm size and productivity. Production efficiency of farms can be highly increased due to increased farm size. Farmers who have high farm area for agriculture production get high output; get more revenue and profit for their livelihood, while the farmers who have less farm size produce a small amount of output and profit for their livelihood.

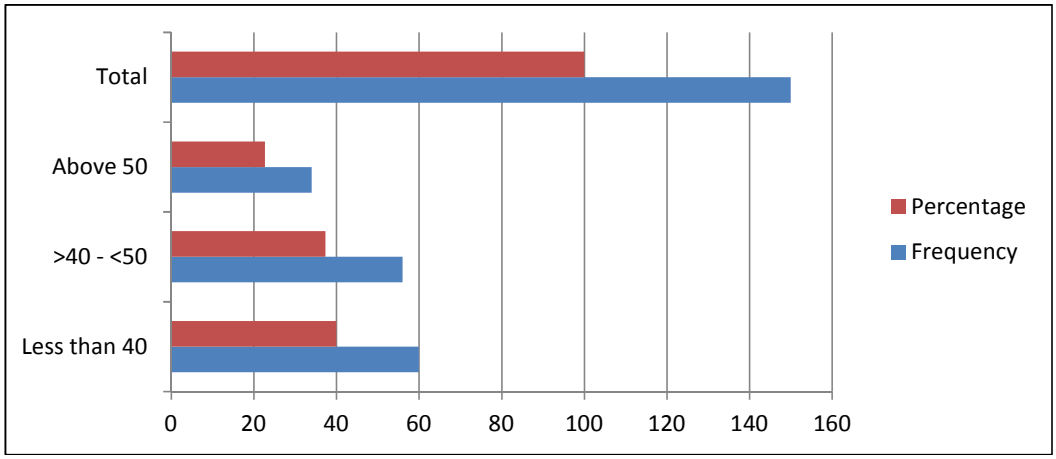

Fig. 1. Distribution of respondents by age group

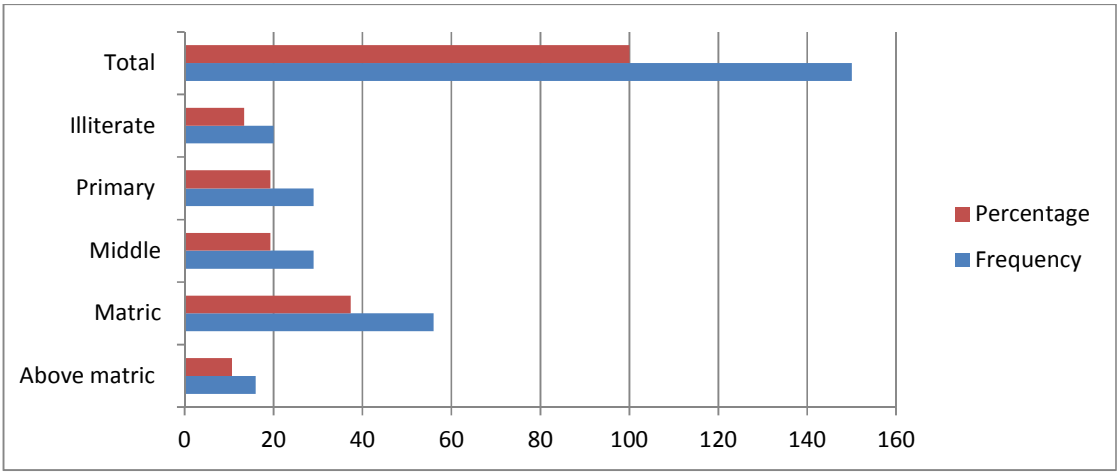

Fig. 2. Distribution of respondents by education level

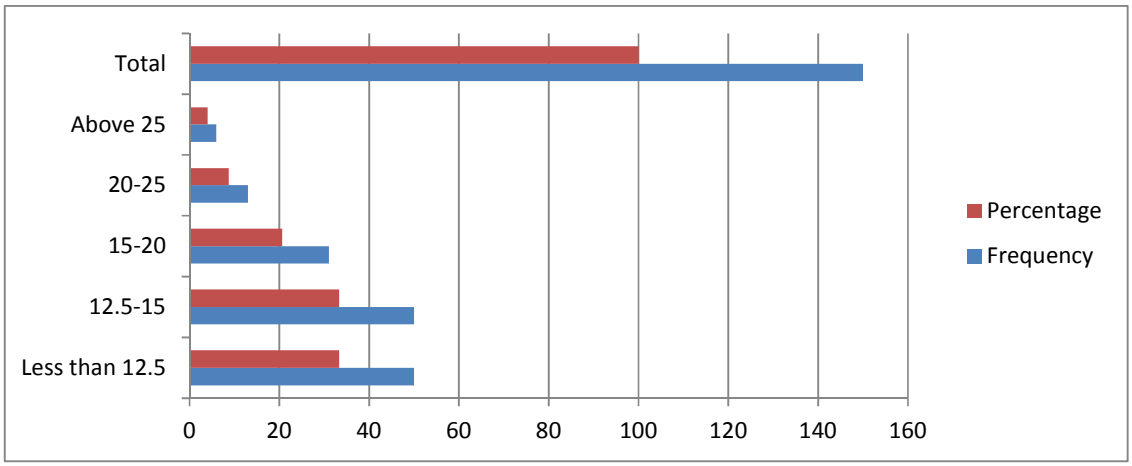

Fig. 3. Respondents distribution by farm size

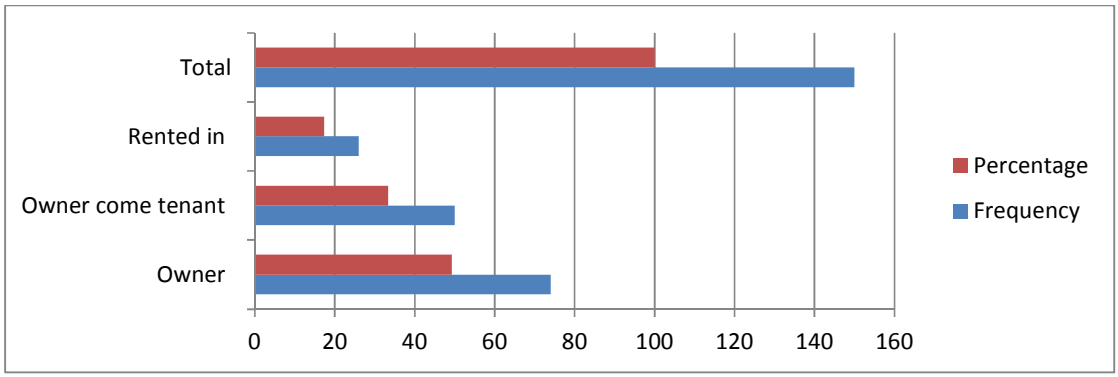

Fig. 4. Tenancy status of the respondents

Results show that 33.3% (50 out of 150) of the respondents had farm size less than 12.5 acres, 33.3% (50 respondents out of 150) had farm size 12.5-15 acres, 31 respondents had 15-20 acres farm size (20.7 percent), 13 respondents had 20-25 acres farm size (8.7 percent) and only 6

respondents out of 150 had more than 25 acre farm size (4 percent) in the study area.

3.4 Tenancy Status of Farmers

Ownership of land under cultivation of rice is the main source of excellence for high yield of rice. The farmers who are using rented land have their profit minimized. Results showed that 49.33% (74 respondents out of 150) had their own area for rice cultivation, 33.33% (50 out of 150) of the respondents had owner come tenant for the rice cultivation and 17.34% (26 out of 150) of the respondents rented area for rice cultivation.

3.5 Respondent Loan Facility

Farmers used to take loans from the banks mostly before harvesting so they are bounded to sell their crops to specific sources. Some farmers get loan facility if they have no credit for agricultural production. They got loan to fulfill their needs of life and agriculture production. The study area showed that small farmers got more loans as compared to large and medium farmers. Results showed that 40% (60 respondents out of 150) have taken loans for agriculture production while 60% (90 respondents out of 150) said that they need no loans facility for agriculture production.

3.6 Different Variety of Rice by Area (Acres)

Varieties that are compatible with the soil conditions have higher chances to produce significant yield. Results indicates that super kernel fine variety was sown on an average area of 4.86 acres (45.12%), 86 fine varieties were cultivated on an average area of 3.31 acres (30.73%) and Kainaat variety was sown on an average area of 2.26 acres (20.99%) in the study area of District Sheikhupura. Super fan coarse variety was sown on average area 0.34 acres (3.16%).

3.7 Cost of Production of Fine Rice Variety

Table 2 showed that the total cost of the Fine variety was 47206.731 and total revenue generated after sale of their product in the market was 53559.996. Profit of farmer considering the total cost and revenue was 6353.265. The benefit cost ratio is estimated to be 1.134.

3.8 Cost of Production of Coarse Rice Variety

Table 3 showed that the total cost of production of coarse rice variety was 42750 per acre and the revenue generated by product sales in the market was 49508.2. Profit of coarse rice variety was 5012.527. The benefit cost ratio of coarse rice variety was 1.11.

3.9 Yield Gap of Fine Rice Variety

The yield gap is the ratio of dividend of an equity and yield of a long term government bond. Typically equities have a higher yield thus reflecting the higher risk of holding equities. Yield gap is big problem for rice cultivation because the yield decreases due to the climate change and other factors that affect the crop yield. Average yield of fine rice was 44.27 monds per acres and high yield of fine rice which the farmer reported that was 55 monds per acres. Table 4 showed that 41 respondents obtained the yield less than 40 monds which is less than average yield of rice, therefore a yield gap existed 54

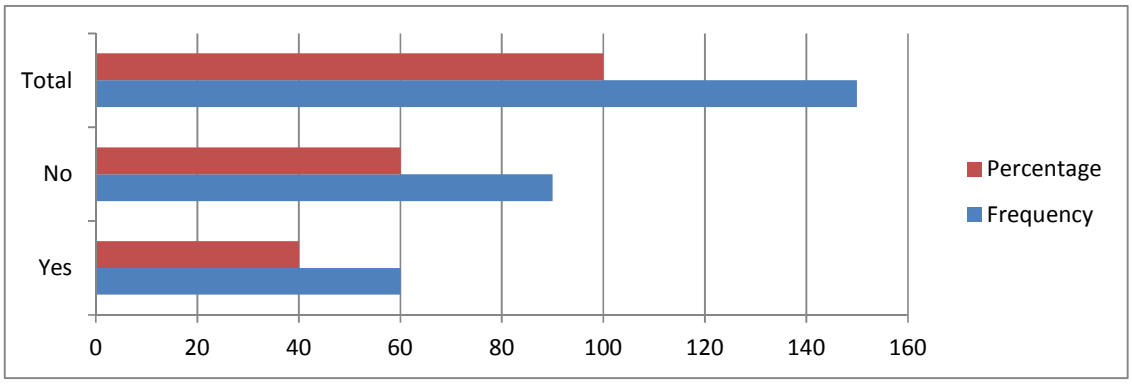

Fig. 5. Distribution of respondents by availability loan facility

Table 2. Cost of production of fine rice variety

Sr. no.	Operations	No. of oprs/unit/ acre	Rate/unit (Rs).	Cost/acre (Rs).
1	**Nursery cost**			
1.1	Area per marlas	4.45		
1.2	Seed (Kg)	9.2	90	828
1.3	Fertilizer (i) urea	(i) 0.2	(i)1500	(i)300
	(ii) Dap	(ii) 0.12	(ii)2700	(ii)300
1.4	Cultivation (plough)	0.33	900	297
1.5	Labor cost	1	600	600
2	**Planting cost**			
2.1	Seed bed preparation	2	700	1400
2.2	No of plough	3.193	983.299	3140
2.3	No of planking	2.667	450	1125
2.4	No of routa vetor	1.2	1490.56	1788.667
2.5	No of leveler	1.846	1000	1840
2.6	Paddling	1	3220	3220
2.7	Uprooting of nursery	1	600	600
2.8	Transportation cost			200
2.9	Planting of nursery	6.866	500.291	3435.333
2.10	Land rent for 6 month		22000	10000
3	**Irrigation cost**	23.6	161.533	3812.17
4	**Fertilizer, weedicide and pesticide**			
4.1	Urea	1.033	1500	1550
4.2	Dap	1.553	2400	3600
4.3	Ssp	1.448	1600	2317.241
4.4	Spray	2.066	1148.39	2373.333
4.5	Weedicide	1		1000
4.6	Labor cost of weedicide			600
5	**Harvesting**			2880
6	**Total cost of fine variety**			47206.731
7	**Yield**	44.633		
8	**Revenue**	44.633	1200	53559.996
9	**Gross profit (8-6)**			6353.265
10	**BCR**			1.1345

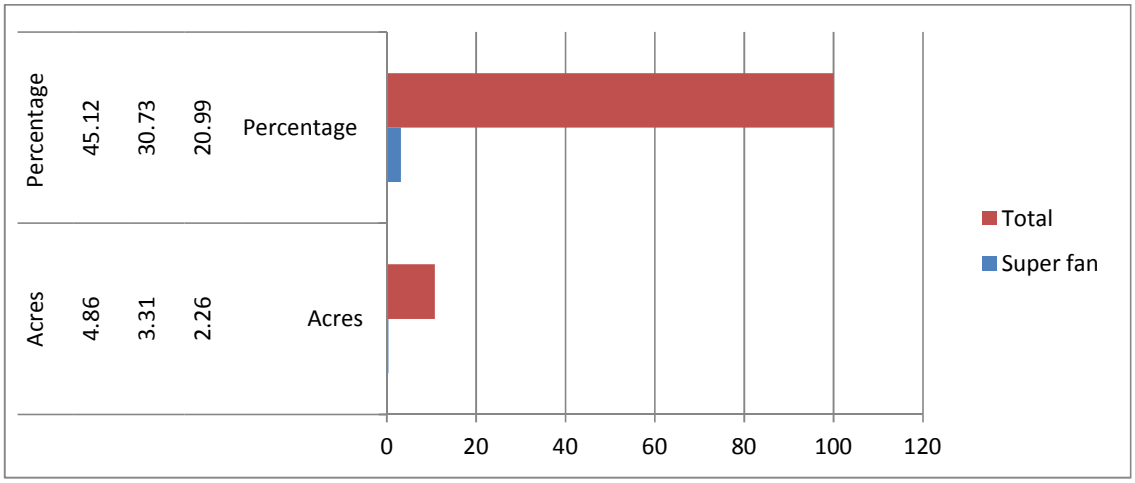

Fig. 6. Distribution of respondents by type of rice varieties

Table 3. Cost of production of coarse rice variety

Sr. no	Operations	No. of oprs/unit/ acre	Rate/unit (Rs).	Cost/acre (Rs).
1	**Nursery cost**			
1.1	Area sow in marlas/acres	2.201		
1.2	Seed (Kg)	3.043	100	304.3
1.3	Fertilizer (Urea)	0.51	1500	750
1.4	Labor cost	1	600	600
1.5	No of cultivation (plough)	1	900	900
2	**Planting cost**			
2.1	Seed bed preparation	2.165	746.184	1615.652
2.2	No of plough	2.582	976.094	2520.87
2.3	No of routa vetor	2.104	1486.776	3128.696
2.4	No of leveler	2.017	1347.414	2718.261
2.5	Paddling	1	3193.861	3193.86
2.6	Uprooting of nursery	2.087	647.478	1351.754
2.7	Transportation cost			200
2.8	Planting of nursery	6.850	507.426	3476.316
2.9	Land rent for 6 month		22000	10000
3	**Irrigation**	20.226	161.533	3266.19
4	**Fertilizer, pesticide and weedicide**			
4.1	Urea	1.035	1500	1552.50
4.2	Dap	1.345	2500	3362.50
4.3	Ssp	1.231	1600	1969.60
4.4	Spray	2.052	1155.508	2371.304
4.5	Weedicide	1	1000	1000
4.6	Labor cost of weedicide			600
5	**Harvesting**			2880.87
6	**Total cost of coarse rice variety**			47762.673
7	**Yield**	47.508		
8	**Revenue**	47.508	900	42750
9	**Gross profit (8-6)**			5012.527
10	**BCR**			1.11

Table 4. Yield gap of fine rice variety

Yield gap of fine variety	Frequency	Percentage
Less than 40	41	27.3
41-45	54	36.0
46-50	36	24.0
51-55	19	12.7
Total	150	100.0

respondents obtained 41-45 monds per acres of rice yield which was low the average yield and there was also a yield gap of rice crop, 36 respondents obtained 46-50 monds yield per acre which a higher yield from average yield and 19 respondents out of 150 obtained proper high yield of fine variety of rice which was 55 and also above the average yield of fine rice showing another yield gap.

3.10 Yield Gap of Coarse Rice Variety

Similarly, the coarse rice variety had yield gap. Average yield of coarse rice variety was 50 mound per acres and highest yield of the coarse variety which some farmers responded that was 60 mound per acres. Table 5 showed that 21 respondents got less than 50 acres per mond yield which was lower than average yield, 92 respondents gets 50-55 mounds per acres which

was high from average yield and only 9 respondents got proper 60 mond per acre yield and there was a yield gap between average and high yield of coarse variety of rice. Furthermore, 28 respondents did not grow the coarse variety of rice.

3.11 Production Efficiency

Production efficiency is defined as the economic level at which an economy can no longer produce additional of a good without lowering the production level of another product. In this study Data Envelopment Analysis (DEA) was used for the measurement of production efficiency for rice production farms in District Sheikhupura. This is the linear programming technique which used data regarding inputs and output for a best practice production frontier over the data points. According to Coelli [8] data envelopment analysis had following advantages:

1) It does not require the functional form assumption to specify the relationship between inputs and output.
2) It also does not require the assumption about distribution of underlying data.

Table 6 showed the production efficiency. Results showed that 12% (18 out of 150) of the respondents were laying the efficiency level 0.41-0.50. 14.67% (22 out of 150) of the respondents were laying the efficiency level 0.51-0.60. 20% (30 out of 150) of the respondents was laying in the efficiency group 0.61-0.70. 13.33% (20 out of 150) of the respondents were laying the efficiency 0.71-0.80. 16.67% (25 out of 150) of the respondents were laying in the group of 0.81-0.90. Similarly 23.33% (35 out of 150) of the respondents were laying in the efficiency group 0.91-1.0.

3.12 Market Problems

Road facility: For the purpose of agriculture commodity sale in the market, availability of roads plays an important role because if proper roads are available then the product is delivered to market on time and with no damage. Results show that 60% (90 respondents out of 150) agreed that proper road facility was available. While 40% (60 respondents out of 150) expressed that poor road facility was available to reach the market regarding sales of their crop yield.

Transport facility: Like road availability transport facility is also very important because transport facilities help the agriculture products reach the market for sale. When the harvesting season is going on, and transport facility is not available on time or if transport facility is available, the charges are very high for going into the market. Results showed that 33.33% (50 respondents out of 150) said that transport facility was good, for going into the market. While 66.7% (100 respondents out of 150) said that they had no transport facility or poor transport facility to reach the market.

Losses of rice production: Rice yield is affected by various factors like diseases, poor quality of seed, rain, climate etc... These losses reduced rice yield every year Results showed

Table 5. Yield gap of coarse rice variety

Yield gap of coarse variety	Frequency	Percentage
Less than 50	21	14.0
50-55	92	61.3
Above 55	9	6.0
Total	122	81.3
Not growing coarse variety	28	18.7
Total	150	100.0

Table 6. Distribution of farmer by production efficiency of farms

Efficiency level	Frequency	Percentage
0.41 – 0.50	18	12
0.51 – 0.60	22	14.67
0.61 – 0.70	30	20
0.71 – 0.80	20	13.33
0.81 – 0.90	25	16.67
0.91 – 1.0	35	23.33
Total	150	100

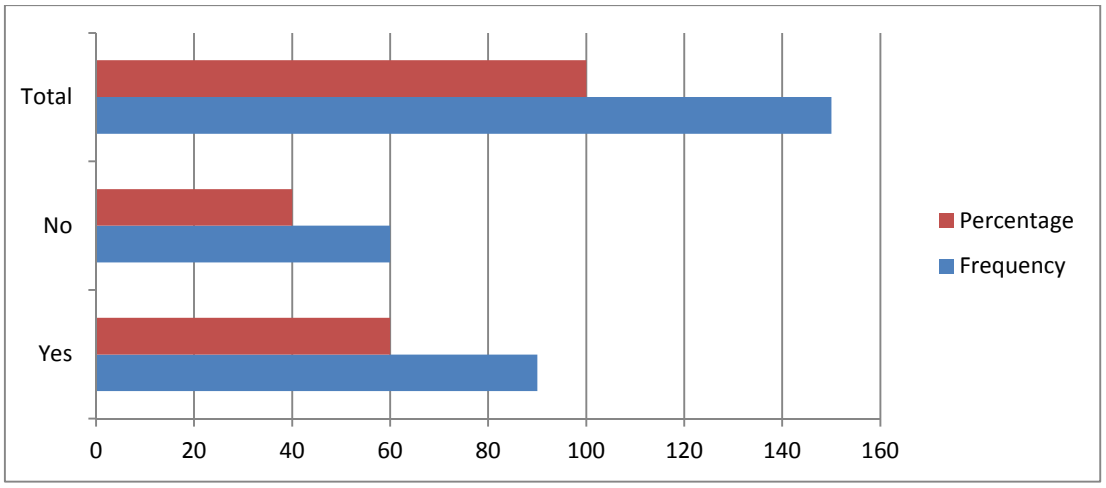

Fig. 7. Respondents opinion regarding road facility

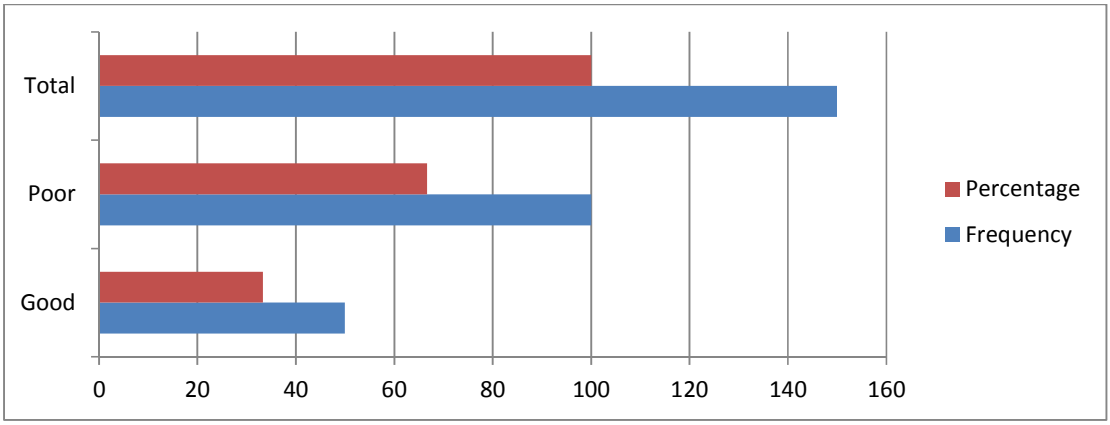

Fig. 8. Respondent's perception about availability of transport facility

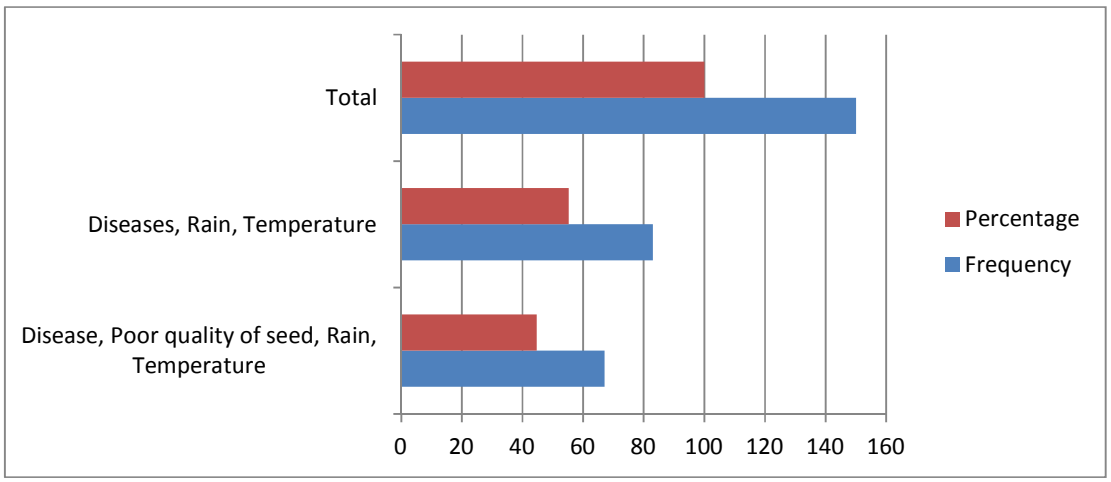

Fig. 9. Respondents perception about losses of rice

Table 7. Summary statistics for yield group

Variables	Coefficients (Bs)	Std. error	T-test	Significance
Constant	3.007	0.406	7.428	0.000*
Sowing time	-0.0162	0.015	-1.141	0.269 NS
No. of cultivations	0.0657	0.060	1.12	0.016**
Seed rate	0.185	0.107	1.74	0.044**
No. of irrigation	0.0766	0.044	1.78	0.039**
Fertilizer nutrients	0.186	0.048	3.98	0.000***

** Significant at 1%; ** Significant at 5%; *** Significant at 10%; R^2 0.514; R^2 adjusted 0.345; Standard error of estimates 0.056; F. Ratio. 1.342*

that these entire factors all combined affect the rice crop and decrease the yield of rice. 44.7% (67 respondents out of 150) said that factors like disease, poor quality of seed, rain and temperature affected their rice crop all combined, and 55.3% (83 respondents out of 150) expressed that factors like diseases, rain and temperature affected their crop and decrease yield of rice.

3.13 Model Explanation for Significant of Yield

$$LnY = 3.006 + 0.0029\ X_1 - 0.0161\ X_2 + 0.0656\ X_3 + 0.184\ X_4 + 0.0765\ X_5 + 0.185\ X_6 + 0.0634\ X_7 + 0.0124\ X_8$$

Table 7 showed that the value of the adjusted coefficient of the determination Adj. R^2 value was 0.345, is not sensitive to number of independent variable or sample size [9], which indicates that the variations in the independent variables explained 34.5% of the variation in the dependent variable. Overall the model was statistically significant [at 90% of significance] as shown by F value which was 1.34 with sig P of 0.056 < α=0.10. The regression model results showed that some statistical significant factors like no. of cultivation, seed rate, no. of irrigation and fertilizer were affecting positively on rice yield while sowing time, chemical cost, holding size and farm yard manure had negative affect on rice crop yield. Result indicates if one percent increases in no. of cultivation rice yield was also increases by 6.56% and standard error was 0.016. The coefficient of seed rate was 0.184 with standard error 0.044 which means that one percent increase in seed rate rice crop yield was also increase by 4.4%. Rice crop need more water for better crop; result of irrigation showed that one percent increase in no. of irrigations yield of rice crop was also increase by 0.0766 percent and standard error was 0.039. Result of fertilizer indicates that one present increase in fertilizer quantity the yield of rice was increase by 18.6% with standard error 0.000.

4. CONCLUSION AND RECOMMENDATIONS

It is concluded that the cost of production of basmati rice was high as compared to the cost of production of coarse variety. Cost of production of coarse variety was low because of the lower number of cultivations, less water applied, less fertilizer used and farmers used less area for cultivation of coarse variety. The major reason for less use of coarse variety is that the market value of the coarse variety is low as compared with the basmati rice.

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Farmers also faced marketing problems like poor road facility, poor transport facility, and no support price of rice, delayed payments for the produce and had no proper channel from which they can get better information about market facilities.

4.1 Recommendation

On the basis of the conclusion some policy recommendations should be made for improvement of rice production and quality of rice with better improvement in price of rice.

- Government should announce support price of rice like wheat keeping of viewing rice cost of production.
- Majority of the farmers are small. Small farmers are always caught up with wishes circle of low investment, low output and lower profit. This circle can be broken by providing investment funds through loan.
- Profit margin of rice production was low i.e., that is few thousands. The profit margin can be increased by increasing yield, in price of output or by reducing cost of production. Cost of production can be reduced by controlling, that is, by having strict vigilance and control over the inputs from the suppliers/ dealers. Therefore, better control of any higher input prices in peak demand season. Similarly, subsidy on specific inputs like seed, fertilizer and energy inputs can achieve the same results.
- Low market prices are the result of gap in the supply and demand of the product, that is, when the product is continuously supplied due to the abundant production on one hand and lower international rice price in the world market leads to huge stock of rice both with the private and public sector parties. To clear these stocks, new export market should be identify and rice export should be encouraged by providing incentives (tax exemption, rebate or obligatory subsidy) to the exporter for better processing facility. In addition, infrastructure should also be provided to improve the competences of Pakistani rice in the international market.
- Rice consumes huge amounts of water that in turn increases cost of production substantially. Consequently, new rice cultivation techniques are needed that can reduce water consumption in rice cultivation. For that purpose, technical knowledge and rice sowing drill should be provided to the farmer on priority bases.
- Farmers growing a number of fine rice variety that are either get mixed at the farm level or in the market, this mixing badly affects practically the exported rice and in extreme situation rejection of the exported consignments. The mixing of variety whether intentional or unintentional should be avoided. All rice stock holders who are producers, market processors, and exporters should be educated to overcome these problems.

CONSENT AND ETHICAL APPROVAL

The authors declare that they have processed the adequate Ethics approval and consent to participate submitted for the BioMed Central License Agreement.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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