

PERFORMANCE OF RICE HYBRID AND OTHER VARIETIES IN SINDH AND BALOCHISTAN

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ABSTRACT

A study was conducted to assess the performance of rice hybrid and other varieties planted in rice growing areas of Sindh and Balochistan during the year 2008-2009. For this purpose primary data were collected from randomly selected 100 rice growers. The farm cost analysis and gross margin analysis was carried out. The results revealed that average yield of hybrid rice was 195 mds/hectare, followed by IRRI-6 (151 mds/hectare), B-2000 (91 mds/hectare) and Rosi (94 mds/hectare). This indicates that the yield of hybrid rice was higher by 29 percent than the major variety IRRI-6. However, the growers received low price by Rs. 8/mds for hybrid rice against IRRI-6 variety. The main reasons for low price was reported as poor grain quality i.e. high percentage of broken rice and variation in the grain size. This study concludes that overall growers earned more profit by adopting hybrid seed technology but there are some repercussions of this technology such as, growers have to buy costly seed every year and have to depend on seed companies. Additionally there is a loss of age-old knowledge and tradition of seed production that sustained rice farming from centuries. As the seed is a basic resource for crop production. Moreover, all stakeholders are in the hands of monopolistic seed corporations.

KEYWORDS: *Oryza sativa*; hybrids; performance; Sindh; Balochistan; Pakistan.

INTRODUCTION

Rice (*Oryza sativa*) is an important food crop and is a major export item. It accounts for 6.1 percent of the value-added in agriculture and 1.3 percent to GDP in Pakistan. The country, in respect to area and production of rice, ranks 10th and 14th in the world, respectively. In Pakistan's economy rice is second food source after wheat and an important foreign exchange earning commodity fetching about \$950 million annually. It is one of the highest water requiring crop, depending on early and late maturing varieties. Course grain

*SSO, TTI, Tandojam, **SSO, SO, TTI, Tandojam, Pakistan.

varieties are early maturing while fine grain varieties are late maturing. Sixty two percent of total rice area is under fine varieties, 27 percent under coarse grain varieties, and 11 percent under others varieties. Moreover, about 96 percent of fine varieties are grown in Punjab because there is suitable climate for maintaining the quality and aroma of these varieties. The yield of fine varieties is much lower than the coarse grain varieties but demand of fine rice is high in national and international markets. So most of the farmers prefer to grow fine varieties despite low yield, high production cost and more water requirement.

Hybrid rice was first commercially cultivated in China in 1976 and its area had been expanded to more than 13 million hectares by 1990 (9). During the last decade, Vietnam, India, Philippines, Bangladesh and United States have also started its commercial cultivation (2). Hybrid rice not only has a distinct yield advantage over inbred varieties but also is more responsive to fertilizer and can adapt to varying environments. Contrary to these advantages, certain disadvantages have also been reported in China and other growing regions. As reported by Husain *et al* (6) in Bangladesh and Janaiah and Hossain (8) in India that hybrid rice had a 15 percent yield gain over the inbred varieties, but it received lower prices in the market because of poor grain quality (4). There are evidences that farmers cultivating hybrid rice realized 16 percent higher yields than current inbred varieties in similar agro-climatic zones of Karnataka and Andhra Pradesh (7). However, in Orissa and Tamil Nadu, India; hybrid rice gave lower yield due to pests and disease attack compared to conventional varieties.

In Pakistan two hybrid rice varieties GNY50 and GNY53 have been introduced among the rice growers in Sindh and Balochistan provinces. These varieties have created tremendous demand among rice growers and consumers. Hence, government approved these varieties for commercial cultivation. Keeping in view the introduction of hybrid rice in rice growing areas in Sindh and Balochistan, there is confusion among rice growers, traders, development specialists and policy makers about the hybrid rice and they face number of problems in adoption of this technology. Therefore, this study was conducted to assess the performance of hybrid and comparing rice varieties in the rice growing areas in Sindh and Balochistan.

METHODOLOGY

This study was conducted through primary data collection from rice growers who had planted hybrid rice in Sindh and Balochistan. Primary data were collected through survey method because its use is common in the field of

social sciences. A wide range of problems can be investigated by applying this approach (3).

Data source

Primary data were collected using a well structured pre-tested questionnaire. The information was collected on farm size, varietal composition, labour costs, inputs costs, transportation and net returns of major rice varieties produced by the growers. The data were collected from eight major rice growing districts in Sindh, and two districts from Balochistan. The selection of rice growers was based on the criteria that they had planted hybrid seed on their field.

Data collection

The data were collected by two stage stratified random sampling, i.e. in the first stage, major rice growing districts were selected, and in the second stage, the location was identified with the help of local rice traders, where they had distributed the hybrid seed among rice growers. From each location about ten growers were randomly selected and interviewed. A total of 100 growers, were determined as a sample size on 95 percent confidence level with an interval of 9.7 for prediction of 5000 rice grower's. The interviews were carried out personally which allowed very detailed insights in rice growing areas. The interviews of rice growers were carried out during the month of January, 2009. Each interview took around two hours.

Data analysis

After completion of field work, the data were edited and transferred from the questionnaires into worksheet as a database file. The variable names within the database file refer to the number of each question in the questionnaire. To measure the performance of hybrid and other rice varieties the analysis based on total costs, total revenues and profit earned in each activity. The procedure of farm cost analysis is explained below.

Total costs: Total cost is sum of the fixed cost and total variable costs for any given level of production, $TC = TFC + TVC$ i.e. total fixed cost plus total variable cost. Farm costs are often divided into various categories. Some of the more commonly used cost concepts are as follows.

Total fixed costs: Total fixed costs are the costs that do not vary with the level of production. For example, the cost of owning a building is incurred

regardless of the fact whether the building is used in full or half of its capacity. .

Total variable costs: Total variable costs are the costs that change in the direct proportion to changes in the amount produced. For example, the cost of feed to feed animals is a variable cost. If the animal is not purchased, no feed costs are incurred, but the fixed costs of the livestock building are still incurred.

Opportunity costs: Opportunity costs are the cost of using a resource based on what it could have earned if used for the next best alternative. For example, the opportunity cost of farming his own land is the amount he could have received by renting it to someone else (5).

Total revenue: Total revenue is the total monetary return from the sale of any given quantity of output at a given price. The total revenue is calculated by taking the price of the sale times the quantity sold (total revenue = price x quantity) (1).

Profit: Profit is calculated by taking the difference of gross income and expenses.

Accounting profit: Accounting profit is the value that actually goes to a farmer's pocket after all expenses except opportunity costs, have been deducted. It is the same as "net farm income".

Economic profit: Economic profit is the value that remains after all costs, including the opportunity costs of the operator's labour and capital, have been subtracted from gross income. It is as same as "return to management" (5).

Gross margin: A gross margin is calculated by taking variable costs away from the gross income, earned from an enterprise. Gross margins are often reported on a per rupees basis for cropping enterprises.

$$\text{Gross margin} = \text{Gross income} - \text{variable costs}$$

RESULTS AND DISCUSSION

Farm size and area allocated to rice crop

The average farm size of the selected growers in the selected regions was recorded as 86.02 hectares out of which 77.24 hectares (89.79 percent) were allocated for rice crop (Table 1). Moreover, in upper Sindh relatively more area was devoted to rice crop (98.02 %) compared to lower Sindh (86.24 %) and Balochistan (81.72 %).

Table 1. Average farm size and area allocated to the rice crop during 2008 -09.

Regions	Farm size (hectares)	Area under rice (hectares)	Rice share in farm area (%)
Upper Sindh	65.62	64.32	98.02
Lower Sindh	69.89	60.27	86.24
Balochistan	158.68	129.68	81.72
Overall	86.02	77.24	89.79

Area under rice varieties

Overall hybrid rice was planted on 23.12 percent area, out of which 19.0 percent was Guard's hybrid (GNY 50 and GNY 53) and 4.11 percent was other hybrid rice varieties (Pokhraj, Royal, Richna, Arise and Dhagha) (Table 2). However, among the conventional varieties IRRI-6 was the most common variety which was planted on about 56.68 percent area followed by B-2000 (9.53%) and Shandar (4.05%).

Table 2. Percent area under rice varieties by regions during 2008 -09.

Varieties/Category	Upper Sindh	Lower Sindh	Balochistan	Overall
Hybrid varieties				
Guard's hybrid rice	15.76	40.48	14.02	19.00
Other hybrid rice	2.35	0.54	8.16	4.11
Total	18.11	41.01	22.17	23.12
Conventional Varieties				
IRRI-6	52.78	48.28	65.85	56.68
B-2000	18.93	0.00	0.67	9.53
Shandar	3.30	1.61	6.17	4.05
Sarshar	1.00	0.00	5.14	2.31
DR-83	1.94	2.52	0.00	1.35
Rosi	2.58	0.00	0.00	1.27
Local	1.37	6.58	0.00	1.70
Total	81.89	58.99	77.83	76.88

While comparing by cropping zone the hybrid in lower Sindh was relatively more popular with 41 percent of total hybrid rice area, out of which 40.48 percent was under Guard's hybrid rice, followed by Balochistan (22.17%) and upper Sindh (18.11). In upper Sindh growers prefer conventional varieties and planted about 81.89 percent of total rice area followed by Balochistan (77.83%) and lower Sindh (58.99%). The more area under conventional varieties in upper Sindh and Balochistan, was reported mainly due to poor performance of hybrid seed during last two years.

Cost of production

Costs were broken down in cash costs and non-cash costs (depreciation and opportunity); costs for production factors that are owned by the rice growers. The overall cash costs of hybrid rice was high (Rs. 44,907), followed by inbred varieties IRRI-6 (Rs.38,940/ha), B-2000 (Rs.33,794/ha) and Rosi (Rs. 31,283/ha) (Table 3). The lowest non-cash costs were recorded for IRRI-6 (Rs.19,046/ha), hybrid (Rs.19,066/ha), B-2000 (Rs.23,709/ha) and Rosi (Rs. 23,707/ha).

Table 3. Cost of production of hybrid rice and other varieties, 2008-09 (Rs/ha).

Zones	Costs	Upper Sindh	Lower Sindh	Balochistan	Overall
Hybrid Rice	Cash cost	42,133	55,182	42,850	44,907
	Non-cash cost	23,788	9,291	24,270	19,066
	Total cost	65,921	64,473	67,120	63,973
IRRI-6	Cash cost	36,677	43,519	38,849	38,940
	Non-cash cost	23,731	9,224	24,270	19,046
	Total cost	60,409	52,743	63,119	57,986
B-2000 (Supper)	Cash cost	33,794			33,794
	Non-cash cost	23,709	0	0	23,709
	Total cost	57,503	0	0	57,503
Rosi	Cash cost	31,283	0	0	31,283
	Non-cash cost	23,707	0	0	23,707
	Total cost	54,990	0	0	54,990

Yields and prices

Overall the highest yield (195 mds/ha) was obtained from hybrid rice followed by IRRI-6 (151 mds/ha), B-2000 (91 mds/ha) and Rosi (94 mds/ha). By cropping zone, growers from lower Sindh received more yield (227 mds/ha) from hybrid rice compared to upper Sindh (190 mds/ha) and Balochistan (185 mds/ha). Suitable climate for hybrid rice varieties has been the reasons for getting more yield in lower Sindh. As far as the prices are concerned the growers received lower price for hybrid rice (Rs. 516/40 kg) compared to IRRI-6 (Rs. 524/40 kg). The reasons for lower price of hybrid rice were reported to be the poor quality, higher percentage of broken rice and variation in grain size. These results are similar as to those of Hussain *et al.* (6) and Janaiah and Hossain (8) who reported that hybrid rice had 15 percent yield gain over the inbred varieties, but it got lower prices in the market because of poor grain quality compared to conventional varieties.

Table 4. Average yield of hybrid rice and other varieties during 2008-09 (maunds/ha).

Unit	Region	Hybrid rice	Other varieties		
			IRRI-6	B-2000	Rosi
Average Yield (maunds/ha)	Upper Sindh	190	153	91	94
	Lower Sindh	227	151		
	Balochistan	185	151		
	Average	195	151	91	94
Average Price (Rs./maund)	Upper Sindh	510	512	890	840
	Lower Sindh	548	570		
	Balochistan	504	504		
	Average	516	524	890	840

Revenue from hybrid rice and other varieties

The data (Table 5) show that total revenue of hybrid rice was higher (Rs. 1,00620/ha), followed by B-2000 (Rs. 80,990/ha), IRRI-6 (Rs. 79,124/ha) and Rosi (Rs. 78,960/ha). The lowest revenue of hybrid rice was (Rs. 93,404/ha) in Balochistan compared to upper Sindh (Rs. 96,900/ha) and lower Sindh (Rs.1,24,396/ha).

Table 5. Revenue of hybrid and other varieties during 2008-09 (Rs./ha).

Region	Hybrid rice	Other varieties		
		IRRI-6	B-2000	Rosi
Upper Sindh	96900	78336	80990	78960
Lower Sindh	124396	86080	-	-
Balochistan	93404	76104	-	-
Average	100620	79124	80990	78960

Profit of hybrid rice and other varieties

The average profit of hybrid rice and other conventional varieties in selected cropping zone indicates that hybrid rice enabled rice growers to obtain the highest profit (Rs. 36,647/ha), while other major rice varieties gave relatively less profit (IRRI-6 Rs. 21,138/ha, B-2000 Rs. 23,487/ha and Rosi Rs. 23,970/ha) (Table 6). By cropping zone, hybrid rice in lower Sindh had received the highest profit (Rs. 59,923/ha).

Gross margin of hybrid rice and other varieties

The results (Table 7) show that hybrid rice growers in selected region obtained the highest gross margin (Rs. 56,634/ha) whereas gross margin of

IRRI-6 variety was the lowest (Rs. 41,105/ha) as compared to other conventional varieties like B-2000 (Rs. 48,052/ha) and Rosi (Rs. 48,532/ha).

Table 6. Profit of hybrid rice and other varieties, 2008-09 (Rs/ha).

Unit	Region	Hybrid rice	Conventional varieties		
			IRRI-6	B-2000	Rosi
Total revenue	Upper Sindh	96900	78336	80990	78960
	Lower Sindh	124396	86080	-	-
	Balochistan	93404	76104	-	-
	Average	100620	79124	80990	78960
Total Cost (Cash cost + non-cash cost)	Upper Sindh	65921	60409	57503	54990
	Lower Sindh	64473	52743		
	Balochistan	67120	63119		
	Average	63973	57986	57503	54990
Economic profit	Upper Sindh	30979	17927	23487	23970
	Lower Sindh	59923	33337		
	Balochistan	26284	12985		
	Average	36647	21138	23487	23970
Opportunity cost	Upper Sindh	23788	23731	23709	23707
	Lower Sindh	9291	9224		
	Balochistan	24270	24270		
	Average	19065	19046	23709	23707

Table 7. Gross margin of hybrid rice and other varieties, 2008-09 (Rs/ha).

Unit	Region	Guard's hybrid rice	Conventional varieties		
			IRRI-6	B-2000	Rosi
Total revenue	Upper Sindh	96900	78336	80990	78960
	Lower Sindh	124396	86080	-	-
	Balochistan	93404	76104	-	-
	Average	100620	79124	80990	78960
Total variable cost	Upper Sindh	41278	35822	32938	30428
	Lower Sindh	54411	42748		
	Balochistan	41710	37710		
	Average	43986	38019	32938	30428
Average total labor cost	Upper Sindh	12145	11955	12493	12810
	Lower Sindh	20759	17559		
	Balochistan	11468	11305		
	Average	13726	13156	12493	12810
Average total factor cost	Upper Sindh	29133	23867	20445	17618
	Lower Sindh	33653	25189		
	Balochistan	30243	26405		
	Average	30260	24863	20445	17618
Average gross margin	Upper Sindh	55622	42514	48052	48532
	Lower Sindh	69985	43332		
	Balochistan	51694	38394		
	Average	56634	41105	48052	48532

Comparing the average gross margin of hybrid rice by cropping zone, it is apparent that gross margin of lower Sindh is higher (Rs.69, 985/ha) than the upper Sindh (Rs. 55,622/hectare) and Balochistan (Rs.51,694/ha). According to the average total variable costs, there is no significant difference between the variable costs of hybrid rice and other major varieties. The highest variable cost was recorded as Rs. 43,986 per hectare in hybrid rice and the lowest variable costs were reported in Rosi variety (Rs. 30,428/ha). However, the average total revenue from hybrid rice and other conventional varieties significantly differed (hybrid rice Rs.100620, IRRI-6 Rs. 79124/ha, B-2000 Rs. 80990/ha and Rosi Rs.78960/ha).

Considering the average total variable costs of hybrid rice by cropping zone, there was higher total variable cost in lower Sindh (Rs. 54,411/ha) than in Balochistan (Rs.41,710/ha) and upper Sindh (Rs.41,278/ha), because the hybrid rice production has very high total labour costs compared to the other conventional variety especially IRRI-6. Rice growers who cultivated hybrid rice attained the highest average gross margin during the year 2008-09 (Rs. 56634/ha) while growers who cultivate other conventional varieties i.e. IRRI-6, B-2000 and Rosi earned an average gross margin of Rs.41105, Rs.4805 and Rs.48532 per hectare, respectively.

CONCLUSION

However, the study revealed that hybrid rice has a distinct yield advantage over the conventional varieties. Its production is higher due to higher cost of seed and high dose of chemical fertilizer. Although the market price of hybrid rice is lower due to poor grain quality yet the profit of hybrid rice was higher than the conventional varieties due to high yield of hybrid rice. The results also showed that hybrids rice gave more profit in lower Sindh compared to upper Sindh and Balochistan due to favorable climatic condition. The cost of hybrid seed is relatively higher than ordinary seeds of rice, which discourages small farmers to take advantage of this new technology. Rice growers have to depend on seed companies to buy hybrid seed in every season.

Majority of the rice growers were found unwilling to adopt hybrid seed due to its failure during last two years, particularly in upper Sindh and Balochistan. The growers reported that paddy fields were lush green but the plants did not have a single shaft of grain on them. The seed companies are importing hybrid seed from China and there are wide difference in soil and climatic conditions between Pakistan and China. It is suggested that provincial Agriculture Department should test such varieties on their research farms to

check whether the imported seed is suitable in our soil and climatic conditions, Agriculture Department should also certify such varieties before cultivation. The cost of producing hybrid rice could be reduced by reducing the cost of hybrid seed, chemical fertilizer and pesticides.

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