

## Factors Influencing Yield of Rice in Balochistan Province

Sulaiman D. Muhammad\*

Saba Zafar\*\*

### ABSTRACT

*The objective of this paper is to determine the important factors influencing rice production in the Balochistan province of Pakistan. The data taken from the Agriculture Statistics of Pakistan span from 1980 to 2012 which is published by the Pakistan Bureau of Statistics. The data on rice production in Balochistan is not available after 2012. Employing the multiple Ordinary Least Square regression model for the study, the analysis revealed that; (i) the production of the rice, (ii) the price of the rice and (iii) the use of the irrigation system are essential independent variables influencing the Yield in KGs per hectares. The study provides valuable policy recommendation to enhance rice production and fulfill provincial food demand.*

**Keywords:** Balochistan, Rice, Autocorrelation, Multicollinearity, OLS.

### INTRODUCTION:

Almost one half of total world population consumes rice as a basic food item. Rice considers as main food as well as a cash crop of Pakistan. Pakistan earns foreign exchange through exporting rice. Pakistan produced 6952 thousand tons of rice in 2008-09, from which Punjab produced 3643, Sindh produced 2537.1, KPK produced 128.2 and Balochistan produced 643.7 thousand tons of rice. Overall, the rice is considerably the best price receiving crop. Easy to digest and equally liked by every age of person. Rice is the one of the best food crop in the world, especially in Asian countries. Seeds of rice contain fiber, oil, protein, salt and starch as well as it also holds vitamins B, E and G. These elements are vital for human body. Unluckily most of these elements during the process after harvesting are lost.

Balochistan is the province of Pakistan, a province that has different culture, tradition, custom, soil, topography and climate. The principally climate of Balochistan is barren and dryness of the climate of is very high. Very little or no rainfall occurs in the region therefore making it complicated for people to survive and crops to grow. No surprise, being the smallest population as compared to other provinces, it has the largest province with respect to area. Despite the fact that for the most part of the region is covered with grasses, herbs, and geophytes, few areas of the province are exceptionally fertile and productive. Due to the variation in climate, temperature also varies with wide ranges same as tropical areas. The fertile and productive soil together with the appropriate weather is good for the agricultural production. In fact, Balochistan is producing different types of rice.

---

\* Prof., FUUAST Karachi. Email: Sulaiman1959@gmail.com

\*\* Lecturer (Economics) Govt. Deg. Coll. for Women, Blk. M, North Nazimabad, Karachi. Email: saba\_zaffarali@hotmail.com Date of Receipt: 10-2-2016

Rice standouts amongst the most essential crops that assume a fundamental part in elevating the economy of any nation. It gives two million tons or more of our diet prerequisites and is an essential basis of income generation as well as employment for provincial zones in the rice production areas. It additionally gives altogether in the foreign trade income. Rice is the 3<sup>rd</sup> biggest crop as far as zone sown, after wheat and cotton, and is cultivated on 3.5 million hectares in 2012. Its significance in the national economy needs no accentuation as it records for 6.1 percent of the aggregate quality included farming and around 1.3 percent of GDP.

Punjab and Sindh are the two provinces that are noteworthy rice-producing regions. Punjab and Sindh represent more than 88% of aggregate production of rice. The climatic condition of Punjab is very good and soil conditions are appropriate for the production of rice so Punjab delivering 100% of Basmati rice in the nation. The districts of Punjab, where rice production is very good are Gujranwala, Hafizabad, Jhang, MandiBahaudin Din, Okara, Sheikhpura and Sialkot, representing 70% or more production of Basmati rice in the nation.

If we talk about Balochistan, Balochistan have good weather conditions used for the production of good quality rice but the rice production in this province is very low because of the resources scarcity in addition to shortage of water accessibility. The districts of Balochistan where rice production is very good are Awaran, Bolan, DeraBughti, Jafferabad, JhalMagsi, Kachhi, Kalat, Khuzdar, Lasbela, Nasirabad, Panjgur, Sibi, Tamboo and Turbat.

Numerous studies have been conducted to determine the factors that affect the production of rice of different provinces; no study of this kind is conducted on Balochistan yet. This study has identified the presence of a 'rice crop output gap'. This "crevice" alludes to the distinction in efficiency of 'best practice' and on different farms working with equivalent technology, factors of production, inputs and innovation under comparable conditions (Kebede, 2001; Wadud, 1999; Villano, 2005). The distinction between real and technically feasible yield for most harvests suggests incredible potential for expanding sustenance and farming production by changes in productivity, even without further progression in employment as well as innovation of additional factors of production such as land, labor and capital and so on. It is for the most part believed that factors of production and inputs in the rural region, particularly in developing as well as in underdeveloped nations, are being employed uneconomically. Agriculturists are for the most part concerned with the benefit of cultivating business which straightforwardly or through implication relies upon factors of production and inputs employment proficiency.

Production of rice in Balochistan may be expanded also through improving so as to expand the territory underproduction of rice or increasing the proficiency of available inputs and factors of production employed in the production of rice in Balochistan. On the off chance that rice agriculturists are as of now in fact

efficient, then increment the production of rice in Balochistan needs new technology, factors of production, inputs and innovation to enhance the production of rice in Balochistan. Nevertheless, if noteworthy chances present to expand the production of rice in Balochistan by more productive utilization of present technology, factors of production and inputs with current innovation, a more stronger case may be made for institutional investment in factors of production and inputs delivery, basic infrastructure, expansion framework, farm administration service, and agriculturists' abilities to improvement in specialized effectiveness of factors of production and inputs employ at the farm level (Ali and Chaudhury, 1990). Henceforth, similar to in different yields it is imperative to research specialized proficiency and its determinants of production of rice in Balochistan.

Even though Balochistan has perfect conditions for the rice production in good quality but the production of rice is very low in Balochistan due to the shortage of resources as well as lack of water availability. The production of rice is not sufficient for own needs of Baluchistan and it depend upon the provinces like Punjab and Sindh to complete its necessities.

The current study is endeavoring to find an association between area under the production of rice and the dependent variable that is rice production in Balochistan. It is likely to direct the policy maker to select where upcoming inputs and factors of production ought to be distributed to increase the productivity of rice. The objective of this study is to determine the factors that affect the production of rice.

The outline of this study is as follows. Section II delineates the review of previous literature. Section III explains the methodology of the research article and data sources. Section IV presents empirical results and discusses their implications. Last section derives a conclusion based on empirical findings.

## **REVIEW OF LITERATURE:**

This paper reports the important factors influencing rice production in the Balochistan province of Pakistan. It was established to offer inferential clarifications for the significance of Balochistan province in agricultural country. It is forecasted over the economic welfare ideals of an area conditional on a leading agronomic activity. It is devised from the word "growth pole" which indicates; a center with certain factors of growth (Perroux, 1955), a topographical collection of activities (Boudeville, 1966) and definitely, the center of an activity whose dynamic capability effects the performance of extra activities in a specific economy (Ivarah, 2003).

In this circumstance, the emphasis is essentially on a specific growth-inducing activity in the Balochistan province. The main determinant effecting structural regional difference along with an important pole is the existence of a propulsive industry (Omura and Onorkerhoraye, 1986). This industry is usually characterized

by three important features; (i) high interaction with other firms; (ii) a high degree of influence, and (iii) great size (Darwent, 1975). Industries possessing these three attributes are normally characterized by output data higher than the average that affect other industries and the total output of the economy (Sule, 2000).

Wasim (2002) examines production of rice in the world with reference to the growth of rice production and instability in area of rice production and productivity of inputs for the span 1974-75 to 1995-96. This era further divided into two parts, that is period 1 span from 1974-75 to 1984-85 and Period 2 span from 1985-86 to 1995-96 to examine the growth and trend in this periods. Wasim (2002) finds out that in period 1, enhances in the productivity is the main reason of growth in production of rice whereas in period 2, improves in the area and productivity are the key reason of growth in production of rice.

### **METHODOLOGY:**

The Empirical model of this study is as follows:

#### **Yield in KGs per hectares<sub>i</sub>**

$$= \beta_0 + \beta_1 \text{Prod}_i + \beta_2 \text{Price}_i + \beta_3 \text{Ferti}_i + \beta_4 \text{Irri}_i + \varepsilon_i$$

Where:

Yield in KGs per hectares:	Yield of rice in KGs per hectares
Prod:	Production of the Rice in thousand tonnes
Price:	Average monthly Price of IRRI rice per 40 kg
Ferti:	Consumption of Fertilizers in inthousand N/tonnes
Irri:	Area in Million Hectares irrigated by different sources

Time series data employed in the study, which is taken from the “Agriculture Statistics of Pakistan” span from 1980 to 2012 which is publish by Pakistan Bureau of Statistics, Statistics Division, and Government of Pakistan. This paper will evaluate the association and nexus between dependent variable and the explanatory variables. The study starts with taking into account (i) the production of the rice, (ii) the price of the rice and (iii) the use of irrigation system and their influence on the per hectare production of the rice in kilo grams.

In Econometrics, a regression which is time series is a kind of regression in which the dependent as well as independent variable are related with different point in time. In our example, regression to explain and predict the production of rice (total production in "000" tons) could be performed by a time series data. In regression using time series would have different data points would be drawn on the same economy but at different points in time.

### **EMPIRICAL RESULTS AND FINDINGS:**

The empirical results of this study are as follows:

**Table No. 1: Test of Multi-Colinearity**

Variable	VIF	1/VIF
Area	17.22	0.058084
Prod	15.39	0.064978
Ferti	7.19	0.139107
Price	5.95	0.168118
Irri	4.72	0.211799
Mean VIF	10.09	

Source: Estimation by Author

### EXPLANATION OF RESULTS:

Table number 1 shows the result of test of multicollinearity among area of production and the total production of rice. According to the principle of Econometrics we have to drop one of the variables between area of production and the total production. The value of VIF of area of production is high as compare to the total production of rice, so we drop the variable area of production. The result with the total production of rice and without the area of production of rice is better than the result without the total production of rice and with the area of production of rice. On the basis of this analysis we take the decision of dropping the variable area of production.

**Table No. 2: Regression Results**

Number of obs	30	R-squared	0.5389	D-W Stats	
F( 4, 25)	11.11	Prob F	0.000		2.02584
Yield in KGs per hectares	Coef.	RobustStd. Err.	T	Prob	
Prod	2.375737	0.7243744	3.28	0.003	
Price	0.8592045	0.1551489	5.54	0.000	
Ferti	-1.270114	2.827531	-0.45	0.657	
Irri	856.505	362.1295	2.37	0.026	
_cons	1089.79	528.0339	2.06	0.05	

Source: Estimation by Author

### EXPLANATION OF RESULTS:

Table number 2 shows the result of the multiple Ordinary Least Square regression model between (i) the Prod, (ii) the Price and (iii) the Irri and their influence on the Yield in KGs per hectares. This model includes 30 observations with 53.89%  $R^2$ . The model is statistically significant at the 1 % level of significance with F statistics 11.11 and probability of F statistics is 0.000. The Durban Watson statistics is 2.02584, which shows that the model does not suffer

from autocorrelation. The variable Ferti is statistically insignificant to affect Yield in KGs per hectares with t value -0.45 and probability of t value is 0.657.

The variable Prod is statistically significant to influence positively Yield in KGs per hectares with t value 3.28 and probability of t value is 0.003 and as Prod increases by 1 thousand ton Yield in KGs per hectares increases by 2.375737.

The variable Price is statistically significant to impact positively Yield in KGs per hectares with t value 5.54 and probability of t value is 0.000 and as Price increases by 1 Rupee Yield in KGs per hectares increases by 0.8592045.

The variable Irri is statistically significant to affect positively Yield in KGs per hectares with t value 2.37 and probability of t value is 0.026 and as Irri increases by 1 unit Yield in KGs per hectares increases by 856.505.

**Table No. 3: Results of Serial Correlation LM Test**

<b>Breusch-Godfrey Serial Correlation LM Test</b>			
<b>F-statistic</b>	1.035255	<b>Prob. F(2,23)</b>	0.3711
<b>Obs*R-squared</b>	2.477624	<b>Prob. Chi-Square(2)</b>	0.2897

Source: Estimation by Author

**EXPLANATION OF RESULTS:**

Table number 3 shows the result of the Serial Correlation LM Test. The null hypothesis of this test is no serial correlation and alternative hypothesis serial correlation is present on the basis of F-statistic value is 1.035255 with Prob. F (2, 23) is 0.3711 and with Chi-Square (2) value is 2.477624 Prob. Chi-Square (2) is 0.2897, we accept the null hypothesis that there is no serial correlation exist in the model.

**Table No. 4: Results of Heteroskedasticity Test**

<b>Heteroskedasticity Test: White</b>			
<b>F-statistic</b>	0.415571	<b>Prob. F(14,15)</b>	0.9456
<b>Obs*R-squared</b>	8.384087	<b>Prob. Chi-Square(14)</b>	0.8684
<b>Scaled explained SS</b>	10.45541	<b>Prob. Chi-Square(14)</b>	0.7282

Source: Estimation by Author

**EXPLANATION OF RESULTS:**

Table number 4 shows the result of the Heteroskedasticity Test. The null hypothesis of this test that the variance of residual is Homoskedasticity and alternative hypothesis of this test that the variance of residual is Heteroskedasticity. On the basis of F-statistic value is 0.415571 with Prob. F(2, 23) is 0.9456 and with Chi-Square (2) value is 8.384087 Prob. Chi-Square (2) is

0.8684; we accept the null hypothesis that the variance of residualisHomoskedasticity.

**Table No. 5: Number and Area of Farms by Size of Farm  
Balochistan (Area in Acres)**

Size Of Farm (Acres)	Number Of Farms		Farm Area		Cultivated Area		Cultivated Area As % Of Farm Area	Average Size Of Farm		
	Farms Total	Total	% Age	Total	% Age	Total		% Age	FARM AREA	CULTIVATED AREA
		359562	100	8145473	100	3491854	100	43	22.7	9.7
Under 1.0	6767	2	2320	*	1711	*	74	0.3	0.3	
1.0 To Under 2.5	66454	18	103763	1	72475	2	70	1.6	1.1	
2.5 To Under 5.0	56193	16	198718	2	163005	5	82	3.5	2.9	
5.0 To Under 7.5	51301	14	296318	4	216002	6	73	5.8	4.2	
7.5 To Under 12.5	66832	19	644994	8	505570	14	78	9.7	7.6	
12.5 To Under 25.0	54419	15	933858	11	710238	20	76	17.2	13.1	
25.0 To Under 50.0	32096	9	1065339	13	662750	19	62	33.2	20.6	
50.0 To Under100.0	15537	4	987394	12	516601	15	52	63.6	33.2	
100.0 To Under 150.0	3744	1	410171	5	221930	6	54	109.6	59.3	
150.0 And Above	6219	2	3502600	43	421585	12	12	563.2	67.8	

Source: Pakistan Bureau of Statistics.

**EXPLANATION OF TABLE NO. 5:**

Table number 5 shows the number and area of farms by size of farm in Balochistan. The total 3, 59,562 farms are existing in the province of Balochistan. The total available land for cultivation is 81, 45,473acres, from which 34, 91,854acres is cultivated which is 43% of total area. The average area of the firm is 22.7 acres and on average 9.7 acres is cultivated.

**CONCLUSION:**

This paper reports the important factors influencing rice production in the Balochistan province of Pakistan. The data taken from the Agriculture Statistics of Pakistan span from 1980 to 2012 which is publish by Pakistan Bureau of Statistics. Employing the multiple Ordinary Least Square regression model for the study, the analysis revealed that; (i) the prod, (ii) the price and (iii) the irri are essential independent variables influencing the Yield in KGs per hectares. The variable Consumption of Fertilizer is statistically insignificant to affectYield in KGs per hectares. The study provides valuable policies recommendation to enhance rice production and fulfill provincial food demand.

Even though Balochistan has perfect conditions for the rice production in good quality but the production of rice is very low in Balochistan due to the shortage of resources as well as lack of water availability. For sustainable development, it is necessarily important to protect the soil and ground water that are two most essential inputs for rice production in Balochistan. The decline of ground water has extreme ramifications on soil efficiency (Sarah and Brad 1993). The safety of agricultural inputs and efficient use of these inputs is the focal subject of present policy framework and in this manner; resources designated for the safeguard of these natural resources ought to be expanded in Balochistan. Government ought to enhance the investment on water administration related exercises to give better watering system facilities to the agriculturists in Balochistan. Investment on agribusiness education and mechanization procedure ought to be expanded in Balochistan. In this way, private sector ought to be urged to invest in education in the rural region and Government organizations, could tie up their credit supply strategy for the buy of tractor to enhance automation. Old agriculturists are actually inefficient and in this manner, youthful should be persuaded to take an interest in agrarian related exercises on the grounds that youthful has better ability to adopt modern technology and to settle on opportune choices.

## REFERENCES

- Ali, M. and M. A. Chaudhury (1990), Inter-regional farm efficiency in Pakistan's Punjab: A frontier production function study. *Journal of Agricultural Economics*, Volume 41, pp. 62-74.
- Boudeville, J.R. (1966). *Problems of Regional Economic Planning*, Edinburgh, Edinburgh University press.
- Darwent, D. (1975). Growth Points and Centres in Regional Planning: in Friedmann and Alonso (eds), *Regional Policy Readings in Theory and Applications*, Massachusetts, MIT Press, 540.
- Ivarah, J.B. (2003). *Regional Planning*, Benin City Tide Publishers.
- Kebede (2001), *Farm Household Technical Efficiency: Stochastic Frontier Analysis, Study of Rice Producers in Mardi Watershed in the Western Development Region of Nepal*. Master's thesis, Department of Economics and Social Sciences, Agricultural University of Norway.
- Omuta, G.E.D and Onokerhoraye, A.G. (1986). *Regional Development and Planning*, Benin, Eguavoen Printers, 10.
- Perroux, F. (1955). Economic space: Theory and Applications, *Quarterly Review of Economic I* (4): 64-89.
- Sarah, L. B. and C. J. Brad (1993), Agriculture's effect on environmental quality: Key management issues. Working Paper No. WQ-17-W, 7/93. Cooperative Extension Service Purdue University and US Department of Agriculture.
- Sule, O. (2000). *Paradigms of Regional Development Planning in Africa: Theory and Practice*, Calabar, Prathel (Nig) Enterprises, 40.
- Villano, A. R. (2005), Technical efficiency of rainfed rice farms in the Philippines: A stochastic frontier production function approach. Working Paper, School of Economics, University of New England, Armidale, NSW, 2351.
- Wadud (1999), *Farm Efficiency in Bangladesh*. Department of Agricultural Economics and Food Marketing, University of Newcastle upon Tyne, UK.
- Wasim, M. P. (2002). A study of rice in the major growing countries of the world: their growth instability and world share. *Pakistan Economic and Social Review*, 153-183.