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STATISTICAL ANALYSIS FACTORS AFFECTING OF RICE PRODUCTION IN PAKISTAN: A CASE STUDY OF DISTRICTS JAFFARABAD AND GUJRANWALA

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ABSTRACT

The article identifies the primary factor influencing rice output in the Baluchistan districts of Jaffarabad and Gujranwala in the Punjab between 1989 and 2008. Secondary data was used, including information on cropping systems, input usage, management strategies, and other pertinent subjects. The production system was found to employ conventional techniques, which results in poor production relative to the potential yield. Two major factors that impacted production were a lack of rain and a lack of water, and 43.7 percent of producers in the research region employed the rice variety. The rice farmers applied just 37.5kg of phosphorus per acre of artificial fertilizer, with little variation in their usage. The rice-planted area in the study region had a loss of 0.04%.54.5% of growers blamed the high cost of chemical fertilizer for the decrease in rice average, while 25% blamed the scarcity of high yielding variety seed. The objectives of this study is to find out the factors affecting on rice production one variety of rice taken from two districts of Pakistan of study purpose.

Keywords: lack of rain, lack of water.

INTRODUCTION

Rice is one of the most important cash crops in Pakistan and also throughout the world. It is the second-largest source of foreign cash after cotton in Pakistan and the second-most significant food afterwards wheat. Since Asia accounts for 90% of global rice production and consumption, rice is primarily an Asian crop. Pakistan grows premium rice for both domestic use and export. Rice has a significant role and is heavily involved in the agricultural economy of the nation. Pakistan is on the eleventh position to produce rice in the world and its fourth-largest exporter. Rice contribution is 0.7% of gross domestic product of Pakistan. And 3.2% of the amount goes in the agriculture. The export of rice makes the wealth of $1.86 b in foreign exchange. In the same time frame, 2.8 million hectares of rice were planted. 6.9 million tons of rice was produced in 2015–16, according to estimates. Rice is one of the most important cash crops in Pakistan and also Since rice and rice flour are the second most popular food in Pakistan and make up around 2.8 million tons of domestic consumption, each family spends on average about 3.8 percent of their total food budget on these items. The agriculture sector is the backbone of Pakistan's economy. The second-largest economic sector, agriculture employs 43.5% of the labour force and contributes 21.5 percent to GDP. 61% of Pakistan's rural population, as reported by NIPS (2016), relies on the agricultural sector for both direct and indirect sources of income. According to the Government of Pakistan (2015), the agricultural industry contributes significantly to Pakistan's exports, receiving 66% of export income. It is true that agriculture and a number of industries are connected. of which the agriculture industry in Pakistan is composed. Arable land covers a total area of 30.34 million hectares, whereas agricultural land covers 34.89 million hectares (PBS, 2016).In

Pakistan, agriculture is the backbone of economic progress. As it is largest part , it generates 21.4 percent of gross domestic , employs 45 percent of the GDP, work force, and supports the expansion of all other economic sectors. The demand for industries for goods and services by the domestic area is stimulated by the strong growth in agriculture, which also provides raw materials to the main subsector of the manufacturing sector, the cotton textile industry, as well as other agro-based industries.

Baluchistan is the least populated of all the provinces in Pakistan, while being the largest in terms of territory, accounting for nearly 43% of the country's total area. Baluchistan has a lengthy, 11000-kilometer-long coastal belt. Baluchistan has 5.96 million hectares of arable land and 7.32 million hectares of total agricultural land. Nasirabad and Jaffarabad are regarded as being the most productive and producing the highest yields of agricultural products out of all the districts in Baluchistan.Rice is the second most common food consumed in Pakistan and it also brings in the second-highest amount of foreign exchange after cotton. On 2883 thousand hectares, Pakistan produced 6883 thousand tons of rice in 2009 (GoP, 2015).Punjab and Sindh are Pakistan's two main rice-producing provinces. More than 88% of the world's rice is produced in these two regions. Punjab produces all of the nation's Basmati rice due to its agroclimatic and soil characteristics. Gujranwala, Hafizabad, Sheikhupura, Sialkot, Gujrat, Bahaudin, significant rice-producing districts in Punjab, which together produce above than 70 percent of the nation's “Basmati rice”.According to a number of recent research on the technological and financial efficiency of crop production, particularly for rice and wheat, there is a production gap. This "gap" refers to the difference in production between farms that employ "best practices" and other farms running under comparable circumstances and with an equivalent resource endowment. Given the gap between true and technically feasible production for the majority of crops, even without further technological development and the use of other resources "(land, water, and labor, etc.)," there exists a good potential in the increase of agriculture and food yield by the productivity improvement.

2. LITRATURE REVIEW:

Ali et al. (1989) studied the profit efficiency of rice. It is focusing on the, to evaluate the farmers' individual profit inefficiency when producing Basmati rice, a variable-coefficient profit frontier was adopted. At levels of agricultural resource and pricing inefficiency, the average was 28%., with a broad range (5%-87%). The loss per acre was Rs.1223. Socioeconomic factors that led to profit loss included the amount of education in farm households and employment out of agriculture. Institutional factors that led to the loss of profit included the use of fertilizer later than planned and water constraints.

Sheikh et al. (2003) studied the logit models for identify the factor. It is focusing on late wheat planting is a persistent issue in Punjab's rice & wheat and cotton & wheat agricultural system since late maturing rice is frequently postponed. As a result, there is currently only a small window of opportunity for the timely sowing of wheat. No tillage methods other than rice and cotton have been developed to speed up wheat farming, but their uptake has fallen behind predictions.

Khan et al. (2009) studied the economic requirement on rice. This study looks at the energy consumption patterns and the relationship between energy inputs and rice output in Pakistan's Dar Ismail khan District. Cross-sectional data collected from former interview made up the data analyzed in this study. To select sample farms, a stratified sampling technique was utilized.

Hussain (2012) studied the impact of disbursement on. This study assesses the impact of key agricultural inputs (loan disbursement, area under cultivation, use of fertilizers, and water on the overall rice yield in Pakistan using a time series extending from 1988 to 2010. The study makes use of a log linear CD production function to evaluate the importance and impact of various
inputs. It is concluded that whereas the other two inputs had a favorable but statistically insignificant impact on rice yield, and availability of water had a positive and statistically significant impact.

Ali et al. (2014) studied the impact of rice sowing. Using the vast data set acquired from 238 rice growers during 2011, this study evaluates the effects of rice planting technique using direct seeding & wheat earnings in Pakistan. The propensity score-matching technique was

employed to correct any sample selection bias that might be brought on by systematic distinctions between rice sowing directly technology adopters and non-adopters..

Chandio et al. (2018) studied the determinants of rice varieties. It is focusing on the, adopting improved and approved high production of crop of different varieties is one important strategy for the increase of the out put of agriculture and improving the standard of living for farmers in developing countries. The main objective of the current study was to investigate the factors affecting the adoption of improved rice varieties in Sindh's northern regions in Pakistan.

Oguntunde et al. (2018) studied the relationship in rice and variable. The study focusing on the, using MLR and SVM analysis, this study investigates the changes in climatic factors and rice yield in southwest Nigeria. The 36-year time span between 1980 and 2015 covered by the climate and yield data was used.

Wang et al (2019) studied the "The Effect of Terrain Factors on Rice Production". It is focusing on the, the production of rice, China's most significant staple crop, is influenced by both the environment and human activity. To guarantee a continual growth in rice output, it is essential to thoroughly evaluate the impact of topographical conditions..

Ahmad et al. (2020) studied the environmental risk between factor and rice farmer. It is focusing on the, while a variety of dangers face the farming community, production and environmental concerns are more important. The views and attitudes of farmers towards hazards have a significant impact on management choices and operations on farms. This study aimed to fill the vacuum created by the improper focus on risk management concerns related to grain crops in poor nations, particularly Pakistan. This study focused on quantifying farmers' perceptions and attitudes towards various dangers to Pakistan's rice harvest. The current study made use of cross-sectional data from 450 rice farmers in Punjab, Pakistan, who were divided into three production categories: low, medium, and high.

Shah et al. (2020) studied the "A Statistical Study Of The determinants Of Rice Production in Pakistan". The paper is focusing on, the second most important crop and staple in Pakistan is rice. To increase output and meet the rising demand, the primary goal of the current study is to identify the factor that influence Pakistan's rice production.

Abbas et al. (2021) studied the impact of temperature and rain. The paper is focusing on the, because of global warming, the pattern of rainfall and temperature fluctuation are changing, which has an impact on agricultural productivity. The goal of this study is to look at temperature and precipitation impacts on rice output throughout the Punjab province of Pakistan from 1981 to 2017. Statistical methods are used to analyze how the climate affects rice output. The results demonstrate that the effects of the highest temperature on rice plants result in a reduction in the number of plants in the replanting stage. The lowest temperature has a favorable effect on rice production as well, since it may lead to plant development, It affects the rice crop during the vegetative phase's replanting stage.

Chandio et al. (2021) studied the rice production in Asia. It focusing on the, This empirical study's goal is to investigate the long-term impacts of climatic factors and non-climatic fertilizer use, and the labor force in rural areas, on rice production in a number of significant Asian rice-producing countries between 1961 and 2016. The results of the test for heterogeneous panel cointegration show that the variables have a stable long-term connection. According to the DOLS findings, warming and CO2 emissions significantly reduced rice production whereas precipitation gradually increased it.

Khan et al. (2021) studied the understanding farm level factor. Climate change has an effect on rice production in the areas of Punjab where this study was undertaken. The study sought to understand how farmers saw and reacted to climate variability and its accompanying factors. A multi-stage sampling technique was used to collect cross-sectional data on 480 rice growers from Punjab's five rice growing areas. An ordered profit model is used to evaluate the elements affecting the degree of adaptation whereas a multivariate profit model is used to explore the factors influencing farmers' decisions to adapt. We learn that local farmers saw significant changes in the climate, including an increase in summer temperatures, a decrease in rain summer, changes in the pattern of precipitation, and changes in the time of the winter cropping season.

Gul et al. (2022) studied the tracking effect on rice. The current study uses yearly time series data from

1970-2018 as its major focus in order to investigate the influence of climatic and non-climatic variables on rice output. The ARDL technique was used in the study to identify the long-term equilibrium links between the variables. Another approach employed in the study to assess the reliability of the findings was regression modelling. The long-term causal links between the variables were verified using the modified OLS, VECM and CCR techniques. The empirical findings also demonstrated that yearly temperature has a detrimental impact on rice crop productivity whereas long term carbon emmission has a positive impact.

Rehman et al. (2022) studied the effect on rice. This study evaluates the main effects on rice. Panel data from 1981 to 2019 are used to use Driscoll and Kraay estimate. The findings of the cross-sectional dependence test show that environmental variables including rainfall, humidity, and have correlation problems in various chosen regions. The study finds an inverted U-shape association between temperature, rice and rainfall. The response of rice yield to average rainfall, temperature throughout the specific culture period, which includes harvesting, blooming, and planting, is quadratic rather than linear. While the square of temperature during planting season is negative and substantial, the coefficient of temperature during planting season is positive.

3. MATERIAL AND METHODS:

Secondary data was acquired in order to describe and evaluate the rice production system, quantify the degree of input, and address other pertinent issues. On a number of variables, such as rice output, yield, and area. Additional data was acquired from a number of sources, including agriculture statistics for Pakistan, Baluchistan, Punjab, and Pakistan's Agriculture Extension.

The examination was carried out from the lower and higher states of two distinct Pakistani zones. A comparative analysis was carried out to identify the many factors that contributed to the decreased rice production in the target region of Pakistan. The major subject of the study is what influences Gujranwala and Jaffaraabad rice output. We used numerous tests to data gathered from Punjab and Baluchistan's agriculture extensions during the previous 20 years. These techniques include correlation, regression, frequency distribution, and descriptive. In Descriptive statistics we study about the methods concerned with summarizing and describing of numerical data.

Frequency distribution:

“Frequency distribution is a data tabulation that includes the number of observations in each group and class as well as how the data were distributed across certain predetermined groupings.

Regression and Correlation.

The term "simple" or "two-way" regression refers to the process of examining a variable's dependency on a single independent variable. Finding the best-fitting straight line on a graph to depict the connection between two variables is done using simple linear regression.

4.Result and Discussion

Around the world, temperature extremes have increased in frequency and incidence as results of global climate change and this stress is now of the utmost concern to plant experts all over the world. Both of these pressures have severe consequences on a plant's growth, metabolism, and development. A significant cereal crop called rice is delicate to both low and high temperature stressors. Rice production requires a temperature range of 25 to 35 °C, and temperatures below or above this range are detrimental to the crop's development, physiology, and yield. The development of roots and shoots is badly impacted by high temperatures (>35 °C), which also hinder pollination, produce poor anther dehiscence, and result in spikelet sterility. The reactions of rice to high temperature stress do, however, differ depending on the speed and duration of the temperature increase. Similar to low temperature, low temperature (20 °C) slows down rice germination and seedling establishment, hinders the development of tillers, interferes with blooming, results in panicle sterility, and ultimately reduces grain production. In this chapter, we reviewed the research on how different phases of rice growth are affected by temperature extremes (hot and cold), and we spoke about potential tactics and chances to increase rice's resistance to heat and cold shocks.

It is commonly known that planting at the right time greatly increases rice production. When rice is planted on farmers' fields depends on a number of

factors, including the kind of kharif crops cultivated after wheat, the prevalence of insects or diseases on kharif crop, the types of soil, the frequency of rainfall (particularly in rain fed belts), and the techniques used to plant rice. To receive the optimum yield, rice plants should be completed by the end of November. Data from Gujranwala and Jaffarabad collected for the study shows that 54% of the total area was regularly planted up until December 1 in 2003, while 55% of the rice field was planned on the same day in 2004. According to the survey, as of the first day of the 2003–2004 academic year, 72.1% of Pakistan's total rice acreage had been planted.

Sowing time	Jaffarabad	Gujranwala	Mean
2002 to 2003			
Since Nov	55	5	30
In 1 Nov to 15	41	62	51.5
Later 1 Dec.	12	22	17
2003 to 2004			
Since Nov	45	7	26
In 1 to 15	43	68	55.5
Later 1 Dec.	8	16	12

FARTILIZER:

Application of chemical fertilizer is essential for improving rice crop production, which has been recognized as an efficient way to solve the problem of food safety brought on by population growth. Input of chemical fertilizer has been expanding quickly in recent years, and N and P have been abused in rice cultivation, which has increased production costs as well as environmental degradation. However, China has a rather inefficient usage of fertilizer. According to estimates from Jin and Yan (2005), rice paddy's recovery efficiency for N, P, and K were only 24.8%, 10%, and 25.4%, respectively. According to reports, China barely uses 30% to 35% of its nitrogen, with the majority being lost to volatilization, leaching, and land surface erosion. As a result, agricultural workers are now faced with a number of issues related to poorer fertilizer usage efficiency and contamination from excessive fertilizer application. The increase of economic and ecological advantages depends significantly on increasing fertilizer usage efficiency and lowering its input. The effects of controlled-release fertilizer and the application of inorganic and organic fertilizer in combination on the physicochemical characteristics of soil and rice crop production have been the subject of much investigation. However, there is currently known about impact of controlled-release fertilizer and the combined application of chemical and organic fertilizers on the quality of rice grains.

SOIL:

The availability of various essential plant nutrients is regulated by soil bacteria, which play a significant role in agricultural output. Extensive monoculture frequently coexists with soil domestication through agriculture, or the conversion of uncultivated lands into cultivated soils, especially in developing countries. However, little is known about how continued cultivation affects the prokaryotic soil microbiota structure after soil domestication, including the extent to which crop plants affect soil microbiota composition and the ways in which changes in microbiota composition affect crop performance.

Effect of Labor Rice Production.

Both family members and non-family members are employed as part of the labor force. Employees from outside the family are often employed for planting, family members work together for fertilization and maintenance, and employees from outside the family are utilized for harvesting. The many ways that labor is used have a minimal impact on rice output.

Farm Size:

It is important to carefully consider resource use and how it affects sustainability and production. Empirical study shows that small farmers monitor labor more effectively than large ones. Small farms are presumably utilizing more labor overall as a result. Third, when it comes to risk and uncertainty, small and big farmers may have different views. Second, small farmers may produce less due to their restricted access to modern input. Larger farms could be more equipped and more ready to accept greater risk. The results showed that 52% of respondents had less than 8 he, whereas 25% had between 8 and 16 he or higher. 30% of all farmers owned farms larger than 16 acres. Medium

farm size was discovered in Gujranwala 19, 47.5%, while low little farm size was found in Jaffarabad 29, 72.5%.

District wise area:

Farm size	Jafferabad	Gujranwala	Total percentage	Mean of farm size hec
Undersized less than 8 hec	80.0	23.0	52.0	15.0
Intermediate between 8 to 16 hec	19.0	40.0	29.0	25.0
Hug greater than 16 hec	10.0	56.0	33.0	170.0
Total	50	50	100	70.0

Harvesting:

Harvesting, which involves both family members and hired labor, is the step in the making of wheat that requires the most labor. The largest producers, who use 77% of their own family members as labor, while the remaining 23% use hired labor. An acre of harvesting typically cost Rs.1415. In harvesting, both male and female labor is employed.

Reason and Change of Rice Production:

One of the primary reasons why farmers decided to grow additional acreage in rice was the high support price of the grain. The analysis's conclusion reveals that 57 and 53%, respectively, of sample respondents in the plain and upper zones mentioned the high price of rice as the primary impediment to the development of the rice-growing regions in these two states. However, according to 58% and 34.6% of respondents, respectively, they were unable to cultivate rice while continuing to cultivate wheat, as shown in the table.

Reason for change	Gujranwala	Jaffarabad
Increase		
High price	**53.1**	**57.1**
Not any other crop in kharif season	**Nil**	**10.2**
Possibility of elevated production of seeds verity	**18.1**	**23.1**
Utilization of more rice usage for home	**16.1**	**12.1**
Vice versa	**13.1**	**7.0**
Reduction		
Expensive fertilizers	**35.1**	**60.0**
Water deficiency	**25.1**	**12.1**
Insufficiency of high productive seed variety	**5.1**	**27.1**
Limitation of electricity	**30.1**	**0.01**
Elevated diesel	**6.1**	**10.0**
No change		
Fertilizer extra price	**30.1**	**44.0**
Water deficiency	**18**	**3.0**
Rescue productivity	**5.1**	**17.2**
Seed shortage	**50**	**45**

Factors of Increase and decrease rice production:

The attitudes of farmers on the increased yield of rice and its causes have been studied. Overall, 27.5 percent of respondents identified increased seed consumption as a significant factor in producing favorable results. The farmers' second key rationale was the availability of irrigation water. However, it was also believed that timely sowing and fertilizer application were the two main predictors of increased rice production. It was also recorded how the farmers felt about the loss in rice production, and 22.5 percent of them thought that the shortage of irrigation water was to blame. Farmers who observed a drop in rice production cited extreme

cold temperatures, a lack of precipitation, load shedding and seed problems.

REASON	Gujranwala	JAFFARABAD	TOTAL
Causes of increase rice yield			
Batter seed	32.0	22	27
Favorable weather	20.1	18	19.05
Accessibility	25.1	36	30.55
Sowing on time	Nil	17	8.5
Fertilizer utility	30	24.4	27.2
Causes decrease of rice yield			
Unavailability of water	12	36.5	24.2
Severe cold	26	24	25.0
Not raining for a time	38	Nil	19.0
Seed problem	14	24	19.0
Load shedding	27	8.5	17.2
Late sowing becase of water available in rice in field	Nil	21.1	10.5

DESCRIPTIVE STATISTICS:

N	minimum	Maximum	Mean	S.D
20	5.00	6.00	5.05	0.22361
20	9.90	19.60	12.97	1.36570
20	5.60	12.33	7.91	1.68327
20				

F-test

The F-test is commonly used in analysis of variance to assess whether the means of two groups are significantly different the basic idea behind the F-test is to compare the variation between groups due to the treatment or factor being studied to the variation between groups due to random error.

	SS	DF	MS	F	Significance
B/w group	9.953	1	9.953	7.030	.016
Within group	25.484	18	1.416		
Total	35.437	19	7.030		

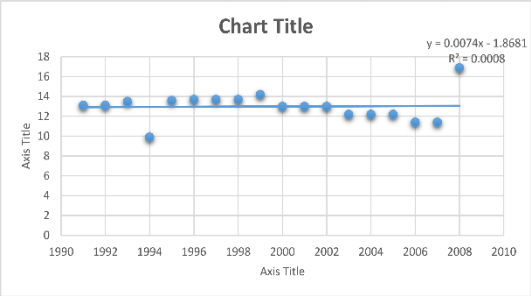
Regression statistics.

Observation	R-square	Multiple regression	Standard error
20	0.027582	o.1660	1.4231

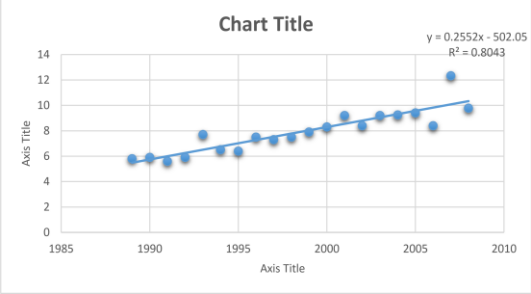
Correlation= -0.03093 (area in hectare for each and their production their correlation)

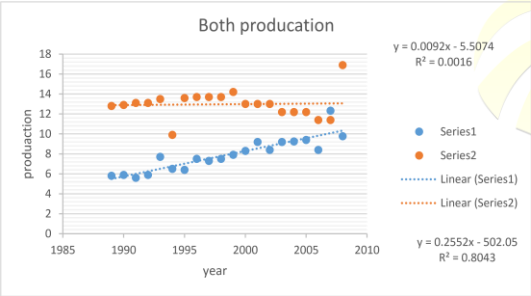
The null hypothesis is rejected because the Jaffarabad production is greater than Gujranwala.

Production of Jaffarabad:



Production of Gujranwala





5.CONCLUSION

This article investigates the impacts on factors effect on rice production in two provinces of Pakistan.By taking one district from each province, the Jaffarabad for Baluchistan and Gujranwala from Punjab province. By using annual time series data of previous 20 years (1989-2008) data collected from Agriculture Extension of Baluchistan and Punjab. The stationary of the variables is resulted by use of correlation, multiple linear regression and F-test. The result has been showed that the Jaffarabad production differed significantly from the Gujranwala. The estimated results indicate evidence of long-term cointegration and relationships between average temperature, climate change factors, and other control variables such rice crop area, fertilizer use, and rice crop yield in Pakistan. The results of the study indicate that rice farmers in the districts of Jaffarabad and Gujranwala are dealing with a variety of issues, ranging in severity. Farmers identified the rising cost of fertilizer and pesticides and weed killers as the two most serious issues, but the majority of farmers said that the inadequate price supplied by middlemen during the selling of the crop was the worst issue. Other issues, such is a shortage of storage facilities, expensive inputs, expensive rent for operating agricultural equipment, and transportation issues when moving produce from the farm to market, and a lack of irrigation water, were considered to be significant issues that had a negative impact on farmers' production and profit margins.

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