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Economic Analysis of Wheat Production in District Layyah Punjab, Pakistan

Muhammad Ali Sikandar¹, Dr. Sadia Anjum^{2*}, Asif Idrees¹, Hammad Ali¹, Muhammad Umar Farooq¹, Iqra Ismail³

1. Lecturer, Department of Economics, University of Layyah, Pakistan.
2. Assistant Professor, Department of Economics, University of Layyah, Pakistan.
3. Department of Economics, University of Layyah, Pakistan.

Corresponding Author; S_anjum31@yahoo.com

Abstract

Wheat is a very basic ingredient of our food and a major source of human food all over the world. It is consumed in different forms, such as it is a major cash crop in Pakistan and occupies 70 percent of the Rabi crop and 37 percent of the total cropped area in Pakistan. The public authority, with the discussion of provincial state-run administrations, had fixed the wheat production focus at 28.89 million tonnes for 2021-22, compared to last year's development of 27.5 million tons. District Layyah has 736,000 tonnes of wheat production between 2019 and 2020. The major challenge for farmers in the Layyah district is changes in climatic conditions, Poor economic and literacy levels of farmers, shortages of irrigation water, and shortages of certified seeds. These adverse conditions have a great impact on wheat production. The objectives of this study are to identify socio-economic issues and the significance mean difference of wheat in the Layyah district. For that purpose, primary data collected from different tehsils (Layyah, Choubara, Karor-Lal-Esan) of district Layyah. Data collected through the personal interview method and a structured questionnaire for the collection of information from 200 farmers.

Keywords: economic analysis, wheat, southern punjab.

INTRODUCTION

Wheat is a common plant whose seed is a cereal grain that is used as a staple supper all over the world. The main utilization of wheat is flour for making bread rolls, treats, chapattis, and so forth. The main wheat varieties are common wheat (*Triticumaestivum*), durum wheat (*T. durum*), and club wheat (*Triticumaestivium*) (*T. compactum*). Wheat is developed as a business crop because it generates a high return for each unit region, thrives in a mild climate with a short growing season, and produces adaptable, excellent flour. The plant includes long, slim leaves and stems, as well as various blossoms, which are borne. Wheat can be grown in a variety of temperatures and soils, but it thrives in climates with precipitation ranging from 12 to 36 inches (30 to 90 cm). Wheat utilized should be handled, which includes tidying and separating the grain

using water. Wheat is cracked and pushed through rollers to frame more modest specifics during processing. Flour is comprised of around $\frac{3}{4}$ part of the processed grain (WPBC, 2022).

In the showcasing year 2020, the worldwide production quantity of wheat added up to more than 765 million metric tons. This was an expansion of more than 30 million tons, contrasting with the past advertising year. The United States creates a lot of wheat every year, which is along these lines sent out. In 2018/2019, the nation imported under 4,000,000 metric tonnes of wheat, while sending out right around 28 million metric tons. In terms of wheat production in 2019, Kansas, North Dakota, and Montana were the leading states in the United States (GWP, 2022). In 2021, the all-out production of wheat overall was 772.64 million metric tons. The top 10 producers of wheat are the European Association, China, India, Russia, the United States, Canada, Ukraine, Pakistan, Turkey, and Argentina. The total area under development for wheat is 29.3 million hectares (USDA, 2021).

Table 1.1 World wheat production

World wheat production (Million tonnes)					
Year	2016/17	2017/18	2018/19	2019/20	2020/21
Production	763.5	761.6	732.1	760.7	775.2

Source: *Food and Agriculture Organization, 2021*

According to preliminary prediction released on March 4 by the United Nation Food and Agriculture Organization in 2022, global wheat production is expected to reach a record level of 785 million tonnes (Schroeder, 2021).

In 2021, the top 10 wheat-producing countries in the world are EU-27 (European Union), China, India, Russian Federation, United States, Canada, Australia, Pakistan, Ukraine and Turkey. In terms of wheat harvested area, Pakistan ranked 8th position and regarding to wheat production, Pakistan stands 9th position among the top 10 wheat-producing countries, but according to the yield of wheat, Pakistan ranked 29th position among the wheat-producing countries in the world (USDA, 2021). The area production and wheat yield of top 10 wheat-producing counties bellow in table 1.2. The table presents the rank of the countries according to their production of wheat.

Table 1.2 Area, production and yield of wheat of top 10 wheat-producing countries

Rank	Country	Area Harvested (1000HA)	Production (1000 MT)	Yield (MT/HA) Approximately
1	EU-27	23,850	137,500	5.76
2	China	23,000	133,6000	5.91
3	India	31,580	108,3000	3.42
4	Russian Federation	29,300	86,000	2.94
5	United States	15,146	51,660	3.41
6	Canada	9,200	32,000	3.48
7	Ukraine	7,170	29,500	4.11
8	Australia	13,200	27.000	2.05

9	Pakistan	9,200	26,000	2.83
10	Argentina	6,500	20,500	3.15

Source: *United States Department of Agriculture, 2021*

Pakistan is an agricultural country and wheat is the significant yield of Pakistan and the priority of every government. The agriculture sector is considered a precious asset for national welfare. It is the most important sector of labor force participation and employees a large portion of Pakistan population, either directly or indirectly Pakistan economy is under-going from many structural changes as it is shifting from agriculture to service. Regardless of these changes, the agriculture sector is one of the most important sectors of Pakistan’s economy. The overall economic output of Pakistan is heavily influence by the agriculture sectors performance. Whatever happens to Pakistan agriculture sector it influences the country’s economic growth rate. Agriculture also provides inputs for other agriculture-based industries. Past experiences show that periods of high and low national economic growth are usually correlated with the growth of Pakistan agriculture sector (Ahmad, 2005).

Agriculture sector contributes 9.2 percent in value addition and 1.8 percent to Pakistan's Gross Domestic Product. The area of wheat in 2021 was 9178 thousand hectares. The area of wheat was extended by 4.2 percent throughout the last year's region of 9178 thousand hectares. The last year’s production of wheat was 25.248 million tons and this year it increases 8.1 percent. The production of wheat in 2021 was 27.293 million tons. The wheat production was 2974 kgs per hectare with an increase of 3.7 percent. The increase in the area, production, and yield was due to changes in the policies of the government and an increase in the minimum support price. The support price of wheat last year was 1400. The MSP in 2021 was Rs 1800 (GOP, 2021).

Pakistan has a total area of 76.9 million hectares, out of the total area around 27 percent is under cultivation and 81 percent it is irrigated. Out of the total cultivated area, 22.10 million hectares of area are used for crop production in Pakistan. Wheat, rice, cotton, maize and sugarcane are the five major crops of agriculture, all these major crops contribute 21.73 percent in the value-added in the agriculture sector and 4.20 percent in GDP (GOP, 2020). The area, production and yield of Pakistan are shown in table 1.3.

Table 1.3: Area production and yield of wheat in Pakistan

Years	Area		Production		Yield	
	(000 hectares)	%Change	(000 Tonnes)	%Change	Kgs/ha	%Change
2015-16	9,224	0.2	25,633	1.6	2,779	0.9
2016-17	8,972	-2.7	26,676	4.1	2,973	7.0
2017-18	8,797	-1.9	25,076	-6.0	2,851	-4.1
2018-19	8,678	-1.4	24,394	-2.9	2,806	-1.6
2019-20	8,825	1.7	24,946	2.5	2,827	0.7

Source: *Pakistan Bureau of Statistics, 2020*

Minister of National Food Security and Research says that the wheat audit panel used to meet twice a year, but that "now, due to the current government's outstanding focus on agri business,

routine checking is being done through week-by-week gatherings. Common partners and senior authorities likewise went to the gathering to screen the continuous planting of wheat crops in the country. The public authority, in conjunction with a meeting of common state-run administrations, set the wheat production target for 2021-22 at 28.89 million tonnes, up from 27.5 million tonnes last year. Punjab farming authority said the territory will accomplish its planting objective. Water accessibility is a continuing constraint, but the Punjab government is working on a track and follow framework for seeds. According to the authorities, the province administration conducted numerous classes to raise awareness, as well as joined with five agricultural institutions in Punjab to engage 3,000 agriculture understudies in ensuring proper wheat seed sowing. (WSC, 21-22).

Table 1.4: District Layyah tehsils areas

	Urban Areas	Rural Areas	Total
Layyah District	468	1152	1620
Tehsils			
Choubara	Nil	448	448
Karor Lal Esan	180	320	500
Layyah	288	384	672

Source: *Layyah Punjab Portal*, 2016

District Layyah is bordered on the north by the Bhakkar region, and on the east by the Jhang area. On its western side, the Indus River flows through D.G. Khan, and on its southern side, Muzaffargarh. The Layyah region covers 6291 square kilometers and includes three tehsils; 1. Layyah 2. Choubara 3. Karor Lal Esan. Layyah is surrounded by a scorching hot atmosphere. Because of its closeness to the Koh-e-Suleman range of mountains, the temperature drops in the winter. The tehsil Choubara is almost devoid of vegetation, consisting primarily of forest and sandhills. The Forest Department has a significant effect on it. The tehsils of Layyah and Karor Lal Esan are equally better-developed agriculturally, although they also feature large sand ridges and undeveloped territory. On the western side of the town, the Indus River flows from north to south, passing through D.G. Khan. The Layyah is located in Sindh River, between the Indus River and the Chenab River. Pakistan's focus region includes Sagar Doab. The District is semi-rectangular in form, with sandy terrain. The new wheat assortments, suggested seed proportion, water system, compost, pesticide, and provincial variables are decidedly adding to increment wheat production. Moreover, taught ranchers can easily be trained for responding to the latest opportunities, and getting themselves changed with social changes in the land (LPP, 2016).

Table 1.5: 10-year wheat crop area, production, average yield of Layyah

Years	Wheat area in acres (000)	Production in tonnes (000)	Average yield per area in mnds
2010-11	22	468	31
2011-12	29	628	25
2012-13	34	736	28

2013-14	34	748	29
2014-15	35	764	27
2015-16	32	695	27
2016-17	34	821	32
2017-18	45	1194	26
2018-19	42	1153	28
2019-20	39	1085	30
2020-21	44

Source: *Layyah Punjab Portal*, 2016

The wheat campaign project was carried out all over Punjab. But this research is based on district Layyah. District Layyah has 736,000 tonnes of wheat production between 2019 and 2020. The major challenges for farmers in the Layyah district are changes in climatic conditions, Poor economic and literacy levels of farmers, shortages of irrigation water, and shortages of certified seeds. This study is based on an effort to analyze the impact of the wheat campaign activity in district Layyah. The specifics of the research are presented as follow;

Objectives

- Determine the Socio-Economic issues of wheat farmers
- To investigate the significance, mean difference in wheat production concerning wheat campaign activity in the study area.
- To give suggestions based on findings.

Research Gap

- Unavailability of panel data, data size, and sample size.
- Some essential variables were not included in these articles due to the non-availability of primary data at the district level.
- In some articles researcher's data collection time period was just one year and dummy variables not include.
- During the covid-19 time period, researchers collected the data through online questionnaire so, results are not found precise.

Review of Literature

Iqbal *et al.* (2005) aimed to forecast the area and production of wheat in Pakistan up to the year 2022. They used ARIMA (Auto Regressive Integrated Moving Average) model in order to meet their objectives. They used past thirty years data for this purpose. Forecasts were made from 2002 up to 2022. These projections were based on the assumptions of i) Absence of random shocks in the economy, internal or external. ii) 20 Agricultural price structure and policies will remain unchanged. iii) Consumer preferences will remain the same. They concluded that in order to increase yield and production selection of high yielding varieties, massive education of

farmers through a network of agriculture officers to make improvements in cultural practices, adequate supply of inputs and full-scale use of latest technology are important. They found that the only way to increase the total cropped area is through reclamation and conservation of land.

Khan *et al.* (2008) explored economic analysis of wheat profitability in Peshawar Valley. Study was conducted in six villages located in three districts of Peshawar valley, North West Frontier Province (NWFP) during 2006-07. A total of 136 respondents were interviewed. Cost and returns (gross margins) of wheat producers were estimated. Farm budgeting technique for estimating cost, returns (gross margins) and profitability in wheat production was applied. Per acre yield was 27.30 mounds (50kg). Total cost of wheat production came to be Rs. 10757.51 per acre. Operations like harvesting/ threshing and land rent were major cost components in wheat production and were 14.28 and 45.54 percent of the total cost, respectively. The gross margins from wheat production were Rs. 5225.75 per acre.

Samiullah *et al.* (2014) investigated the wheat gross margin and cost in district Dera Ismail Khan. 11 villages were selected randomly in district Dera Ismail Khan which was the major producer of wheat production. The sample size was 50 farmers and the personal interview method was used for data collection. To estimate profitability, cost of production and gross return farm budgeting technique was used. The result of the data analysis was Rs24716.32 average cost per acre and Rs 45315.39 per acre gross return. The net profit was Rs20599.07 per acre. The conclusion of this study was there was a negative relationship between profit and cost of production and there was a positive relationship between the size of grain and the price of wheat.

Shiferaw *et al.* (2014) conducted a study to improve wheat varieties and impacts on household food security in Ethiopia. The data for this study came from an Ethiopian farm-household survey done by the International Maize and Wheat Improvement Center (CIMMYT) in collaboration with the Ethiopian Institute of Agricultural Research (EIAR) in 2011. The information was gathered to analyze wheat technology uptake and its effects on smallholder farmers. The information was gathered using a standardized questionnaire that had been pre-tested by skilled and experienced enumerators who were familiar with the agricultural practices and spoke the local language. To choose villages from each agroecology and families from each village, a multi-stage stratified selection approach was used. Researchers used a recent nationwide and extensive farm household survey to quantify the effects of new wheat technology adoption on food security among smallholder farmers in Ethiopia. The results were comparable across estimating approaches, indicating that the implementation of wheat technology had a major beneficial influence on food security (Shehata *et al.*, 2023).

Akhtar *et al.* (2015) Pakistan's main staple grain is wheat, which is utilized for many different things. With a 10.1 percent contribution to Pakistan's agricultural value added and a 2.2 percent GDP share, the crop is also crucial to the nation's economy. In this particular circumstance, the current study looks at the economic analysis of wheat for each productivity level in the Rajanpur district. Interviews were conducted with 120 respondents in total. The following were the regression results for the groups with high, medium, and low yields. R² had values of 0.73, 0.75, and 0.68. Benefit cost ratios for low, medium, and high yield groups were 1.32, 1.60, and 1.96 in the sample area, with opportunity costs of land and family labor. In order to advise farmers on how to use agricultural resources efficiently, there is an urgent need to improve coordination

between extension agents and agricultural researchers. Pure and good seed plays a significant role in raising agricultural yields (Raza, Khalique, et al., 2023).

Abro and Awan (2020) investigated the result of major and minor crops per acre and their tendency of profitability of minor and major crops in Pakistan. The purpose of this study was to look at the average revenue per hectare of minor and major crops in Pakistan and provide recommendations to policymakers on how to encourage farmers to plant profitable crops on their farms so that they may earn more money. For the study of empirical data, a hypothesis testing approach was applied. Following data analysis, the average revenue of minor crops was found to be higher than the average income of main crops. Between 1980 and 2010, the revenue of minor crops decreased. The trend gradually reversed, and the profitability of main crops fell.

MATERIAL AND METHODS

Methodology is an important aspect of research that specifies a collection of actions, standards, and methods by which the analyst conducts the investigation properly (Jonker & Pennink, 2010). Therefore, this research is based on intensively reading published and unpublished journals, articles, and thesis. To make the review articles briefer, tables and figures were used as reviewing techniques in addition to narrations. The objective of the research to find the socio-economic issues of wheat farmers and significance mean difference of wheat production concerning wheat campaign activity in district Layyah. The methodology techniques consist of purpose of study, sampling procedure, data collection methods, units, coding and presentation of data, examination and statistical analysis of data etc.

3.1 Research design

The way of conducting the research is one aspect of the investigation procedure. This is referred to as the study design, and it usually entails surveys, interviews, observations, and/or experiments. The nature of this study is that it is descriptive.

3.2 Sample selection of area

A sufficient and evidence-based sample is required to find reliable outcomes. The data on required variables were gathered from 160 farmers using purposive sampling technique. Detailed description of the study area is given as under:

Majority of the people in the district Layyah rely on agriculture for their livelihoods, both directly and indirectly. It is situated in the southern part of the Punjab's province. The data were collected using convenient sampling from selected wheat growers of tehsils (Layyah, Choubara, Karor-lal-esan) in district Layyah. Layyah, Karor tehsils are famous for wheat, sugarcane and cotton zone. Choubara tehsil is famous for wheat zone.

3.3 Data Collection

Data were obtained through personal interviewing from the wheat growers; Questionnaires were used for collection of the data on livelihood and productivity of wheat accompanying socio economic attributes. Human beings are main subject of social scientists which are very sensitive

naturally. In these researches it is necessary that during formation of analysis observation, all features of data regarding quality and human nature should be under consideration. Both qualitative and quantitative procedures were used to attain inferences based on facts.

3.4 Interviewing the respondents

The main aim of Interview was to collect data and important facts from respondents. The information of interview collects by every respondent to stay aware of the unbiased response, as it was quite difficult to reach the same respondent at all possible stages. Set of different questions were developed for different farmers. Data collected through personal interviews conducted by researcher himself. Data were collected in local language (Saraiki) after that it was translated in the English. The questions were arranged in such a way that respondent do not feel any hesitation in giving the information, as the respondent hesitate in giving the information and were afraid of the taxes and some other issues. Components included in the questionnaire are given below:

- Information about overall socio-economic characteristics of wheat growers such as age, education, household size, farming experience and holding land area.
- Information about wheat campaign program and its impact on production and area under wheat cultivation.
- Data about the market limitation that restricts the production of wheat.

3.5 Pre-testing and final survey

Designing the unrivaled survey questionnaire is impossible. To detect the efficiency of survey questionnaire it is essential to pretest it preferably than truly utilizing it. Pretesting can assist to detect the stability and weakness of survey regarding question formats, wording and arrangement.

Subjected to a validation process were used to determine the instrument's validity, and each explanation was assessed to see how relevant it was. The members were appealed to decide the efficiency and suitability of every question Moreover they were asked for advising any alternation, accumulation or removal of any question or portion of the question. A lot of alternations were proposed by the experienced persons. Some communication sentence/questions were removed and addition of some new communication sentence /questions was done. Changes were made in the designed questionnaire after pre-testing for the preparation of the final questionnaire. For required statistics final survey conducted.

3.6 Data analysis and interpretation

The "Statistical Package for Social Sciences (SPSS)" computer application and Microsoft Excel were used to conduct the data analysis. Descriptive statistics such as percentages, means, standard deviations, t-tests, correlations, and frequencies were used to analyses and report data from open-ended questions (where appropriate). The open-ended questions (reader comments) were categorized and analyzed using Patton's (1986, 1990) and Strauss and Corbin's (1986, 1990) qualitative analysis methodologies (1990).

3.7 Field experience

The researcher faced many challenges while collecting the data. Some of the problems were; farmers had less knowledge and understanding about the purpose of research they showed less interest in answering the questions. One of the main challenges was to make sure they understand the research purpose. Farmers did not have any documentation about the production of wheat and input cost. Wheat growers delivered the information roughly as per their knowledge. According to farmers for wheat cultivation they get help from the government extension department.

3.8 Model Specification

To quantify the impact of socio-economic variables on wheat production following model is used for regression analysis:

Where;

WPR = Wheat production

AGE = Age of farmer

EDU = Education level of farmer

HHS = Household size

LPTC = Land Preparation total cost

ITC = Irrigation total cost

PTC = Pesticide total cost

FTC = Fertilizer total cost

The description of variables is presented in Table 3.1.

Table 3.1: Description of Variables

Variables	Description of Variables	
Dependent Variables		
WPR	Wheat production	Munds per acre
Independent Variables		
AGE	Age of grower	Age in years

EDU	Education level of grower	Completed years of schooling
HHS	Household size	Number of members
LPTC	Land preparation total cost	In rupees
ITC	Irrigation total cost	In rupees
PTC	Pesticide total cost	In rupees
FTC	Fertilizer total cost	In rupees
Agronomic Constrains (Socio-economic issues)		
C1	Seed availability, Seed Quality, Seed cost, Fertilizer Quality, Pesticide Quality, Water Shortage	= Yes = No
Environmental Constraints		
C2	Temperature, Rainfall	= Yes = No
Economic Constraints		
C3	Cost of Production, Output Prices, Variability in Output prices	= Yes = No
Marketing Constraint		
C4	Weight measurement method, No. of buyers, Market fee, Mode of payment	= Yes = No
Financial Constraint		
C5	Inadequate capital and credit inaccessibility	= Yes = No
Fertilizer Constraint		

C6	Fertilizer at unaffordable price	= Yes = No
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Source: Author’s own calculations, 2022.

3.9 Econometric Analysis

To investigate socio economics issues of wheat farmers in district Layyah data were analyzed by frequencies and percentage. To find significance mean difference of wheat campaign activity data were analyzed by one sample T-test and independent sample T-test. Regression analysis is conducted by using Ordinary least Square (OLS).

3.10 Conclusions

This chapter presents the data sources and sampling design, model specification and econometric techniques to analyze economic analysis of wheat production in Layyah district. The data of 160 farmers is used to attain the goals of the study. Chapter 4 presents the complete analysis.

RESULTS AND DISCUSSION

4.1 Socio-economic issues of wheat farmers

Pakistani farmers have several difficulties in managing Wheat production, such as a lack of soil testing on farms, low quality and non-availability of fertilizers, crop loss after harvest, a shortage of warehouses, machinery, and equipment, and, most importantly, a decline in soil fertility.

Table 4.1.1. Socio-economic issues of wheat farmers

	Frequency		Percentage	
	Yes	No	Yes	No
Agronomic Seed cost, and pesticide cost	99	61	61.9	38.1
Temperature, rain fall, wind	101	59	63.1	36.9
Economic cost	148	12	92.5	7.5
Market prices, commission agent fee, buyer’s availability	126	34	78.8	21.2
Inadequate capital, credit inaccessibility	147	13	91.9	9.1

Fertilizers at unaffordable prices	138	22	86.3	13.8
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Source: Author’s own calculations, 2022.

It is clearly observed in table 4.1 that 99 farmers out of 160 farmers claimed that agronomic seed and pesticide costs are very high in their area because agronomic seed and pesticide prices are not affordable and their percentage is 61.9 percent. But 61 respondents do not agree with this statement. They say that agronomic seed costs and pesticide costs are generally suitable and their percentage is 38.1 percent. It is clearly observed that 101 respondents agree with the statement of high temperature, rainfall, and wind in this year and the percentage is 63.1 percent, but 59 respondents say that in this year the temperature, rain fall, and wind are suitable for wheat farming and the percentage is 36.9 percent. It is clearly observed that 148 farmers of Layyah agree that the economic cost of production is high for wheat yield and the percentage is 97.5 percent, but only 12 farmers do not agree with this statement that economic cost is high and the percentage is 7.5 percent. It is clear that 126 respondents agree with market prices being high, commission agent fees being high, and buyer availability being high, but 34 respondents do not agree with this statement. It is clearly observed in this table that 147 respondents agree with this statement that inadequate capital and credit are inaccessible, but 13 respondents do not agree with this statement. Fertilizers at unaffordable prices 138 farmers agree with this statement, but 22 farmers do not agree with this.

Table 4.1.2. Significance mean difference of wheat campaign activity

	Frequency		Percentage	
	Yes	No	Yes	No
Wheat campaign activity in your area?	129	31	80.6	19.4
Benefited?	122	38	76.3	23.8
Campaign information useful?	101	59	63.1	36.9
Wheat campaign activity happens to every year?	143	17	89.4	10.6

Source: Author’s own calculations, 2022.

Table 4.1.3. One sample T-test statistics

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Last year wheat production	160	1.981	.7135	.0564
This year wheat production	160	2.219	.6699	.0530

Source: Author's own calculations, 2022.

One-sample t-test applied for comparison between last year's wheat production and this year's wheat production. Data collected from 160 farmers. According to research, wheat production had a significant and positive result this year. This year's wheat production increased compared to the previous year, and the main reason is wheat campaign activity. Last year wheat production one-sample t statistics mean is 1.981 and this year wheat production mean is 2.219. Standard deviation of last year wheat production is 0.7135 and this year wheat production is 0.6699.

Table 4.1.4. Independent sample T-test

	Wheat campaign activity in your area	N	Mean	Std. Deviation	Std. Error Mean
This year wheat production	No	30	36.36	2.2511	.4110
This year wheat production	Yes	30	39.66	2.9282	.5346

Source: Author's own calculations, 2022.

To investigate the significance, mean difference in wheat production concerning wheat campaign activity independent sample t-test were used. For that purpose, data was collected from 60 farmers where 30 farmers said that wheat campaign activity was done in their area also, and 30 farmers said that there was no wheat campaign activity done in their area. A positive outcome of the analysis shows wheat campaign activity. This year wheat production was higher than the area where wheat campaigning was conducted. Where wheat campaign activity wasn't done, the average results from 30 respondents are 36.36, and where it was done, the average results from 30 respondents are 39.66.

4.2. Estimation of regression model

This section presents the factors of wheat production in the Layyah district. Table 4.27 presents the outcomes. The dependent variable used in a model is wheat production, while independent variables are age (AGE), education (EDU), household size (HHS), land preparation total cost

(LPTC), irrigation total cost (ITC), pesticide total cost (PTC) and fertilizer total cost (FTC).

Table 4.2.1. Results of regression analysis

Independent Variables	Unstandardized Coefficients		T	Sig.
	β	Std. Error		
Constant	4.270	.843	5.068	.000
Ln AGE	-0.057	.025	-2.247	.026*
Ln EDU	0.070	.014	5.092	.000*
Ln HHS	0.048	.021	2.303	.023*
Ln LPTC	0.052	.079	.657	.512**
Ln ITC	-0.061	.021	-2.848	.005*
Ln PTC	-0.088	.037	-2.365	.019*
Ln FTC	0.020	.016	1.250	.213**
*= 5% , **= $Above\ 5\%$				

Source: Author's own calculations, 2022.

The results of regression analysis are presented in table 4.27. The results indicate that coefficient of age (AGE), irrigation total cost (ITC) and pesticide total cost (PTC) are negative and significant at 5%. The coefficient of education (EDU) and household size (HHS) are positive and significant at 5% while the coefficients of land preparation total cost (LPTC) and fertilizer total cost (FTC) are positive and insignificant.

Age (AGE) is negatively related to wheat production that is statistically significant. The average amount of wheat produced per acre falls by 0.057% due to older farmers seldom adopt modern farming methods or new technology that may lead to reduction in wheat crop production. If the farmer utilized modern technology for harvesting purpose it can enhance the production and reduce the harvesting loss (Usman Ali., 2021).

The coefficient of education (EDU) and household size (HHS) are positive and statistically significant. Farmer's education and household size directly link with each other. Educations enhance the farming skills and productive capabilities of the farmers. It enables them to follow some written instructions about the application of adequate and recommended doses of chemical

and other inputs so; result indicates that educated farmers perform all farming activity efficiently as compare to uneducated farmers (Huang and Luh 2009). The household size is larger; more labor force contributes to production activities that mean increase in manpower increases the farm productivity.

The coefficient of land preparation total cost (LPTC) is positive but statistically insignificant. Results indicates that when land preparation total cost increase than wheat production increase.

The coefficient of irrigation total cost (ITC) is negative but statistically significant. The result indicates that when irrigation cost rises output falls by 0.061%. This may be due to the sharp rise in oil prices in the current year (Khalid et al., 2023). Additionally, wheat crops require 5 to 6 no. of water, but the higher expense of irrigation has a negative effect on wheat production (Muneeb Sagheer., 2021).

The coefficient of pesticide total cost (PTC) is negative but statistically significant. The result indicates the price of pesticides rises, wheat productivity falls by 0.088%. Cause may be lack of knowledge for proper application of pesticides. Since wheat plants essentially require 3 to 4 pesticides (lambda, cyhalothrin, buctril and stinger). Increasing the number of sprays without proper applications has a negative impact on wheat production (Muneeb Sagheer., 2021).

The coefficient of fertilizer total cost (FTC) is positive but statistically insignificant. Result indicates that when a farmer rises the cost of pesticides than wheat production increase because an efficient use of pesticides increases the productivity of crop (Raza, Khalid, et al., 2023a).

Recommendations

- Most of the rural farmers have no access to extension service. Extension services must be provided in these rural areas and they must be made successfully by hiring service providers who are well-versed in the latest technology and their benefits.
- Government should be invested in agriculture sector for all farmers of the country and relief on the agricultural products (fertilizers, pesticides and seeds).
- Government should announce relief programs for agriculture, which is encouraging, but in order to prevent any more problems from the agriculture, the process should be clear and simple to use.
- The government should act carefully to handle the agriculture issues because it's very important for the economy of the country and Pakistan economy is based on agriculture.
- Government should give subsidies to the farmers that farmers can increase their productivity.

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