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Economic Analysis of Maize Production In District Tando Allahyar, Sindh

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ABSTRACT

Maize (Zea mays L.) is a vital staple and cash crop in Pakistan, contributing significantly to food security and farmer livelihoods. As a high-yielding cereal crop, maize plays a pivotal role in agricultural economy as well. The present study was undertaken to analyze the maize production in selected area of district Tando Allahyar, Sindh. In total, 120 maize producing farmers were selected by using simple random sampling method. Primary data were collected by interviewing the farmers directly. The collected data were analyzed in tabular form. It was found that the age of the respondents with the age group of 18-20 years of 31.67 percent, the education level 46.67 percent maize farmers were primary level of education. The respondents having farming experience of 21-30 years of maize farming experience had 48.83 percent. It is evident from the results, where each maize producer averaged 745 mounds per acre. The revenue per acre of Rs. 33525.00 and Rs. 152062.5 in total expenditures. The chosen maize producers obtained an input-output ratio of 1:2.20 from the research area's maize production. The study finally concludes that maize is definitely an important crop for farmers because its yield is

increasing regularly. The cost required for maize crop is low as compare to its return on one hectare, however, profit on one hectare is exceptional and beneficial for country's economy and individual betterment. Offering subsidies for key agricultural production inputs like hybrid seeds and chemical fertilizers, as well as price assistance throughout the harvest season, would further increase producers' returns from this crop. The government should offer several educational initiatives, seminars, and workshops on the best ways to grow maize in rural areas.
Keywords: Maize, Economic Analysis, Cost-Benefit, Agriculture

INTRODUCTION

Maize (Zea mays) is the third most important staple food in the world today, and also an important food economy in sub–Saharan Africa (FAO, 2003). It is recognized as one of the longest cultivated grain crops in history. Maize is the most important staple food in Nepal mountain area About 75% of the 8000 hectares of maize are located in this area (Paudyal and Poudel, 2001). Maize also grows in several region of the world and it is referred to as the world best adapted crop. Over time, maize is not only a source of food for human beings and livestock, but also a source of income and foreign exchange. Maize is the world's highest yield grain crop, it is very important for countries like Pakistan, because the demand for rapid population growth has deprived the existing food (Memon et al., 2012) feed and fodder supplies. Ransom et. al. (2003) reported that maize dominates the agricultural sector of Terai, employing 60% of the work force and 28% of the gross domestic product (GDP, 2006). It is a multi-purpose crop, the production of maize as raw material and the production of livestock feed. It helps to exceed 15%. 10% of total agricultural production and agricultural employment in the country. It is also important for sustaining livelihoods and commercial farmers. In Pakistan, the consumption of maize directly for human consumption is decreasing, but its utilization in feed and wet grinding industry is much faster than expected (Tariq and lqbal, 2010).

The main demand of maize comes from feed department, followed by wet milling. The demand for maize from the subsectors of poultry and livestock, is expected to increase and can do more to increase the value of Pakistan's maize crop. Wet milling of maize produces a series of products, by-products and added value (GoP, 2018). In the development of the livestock and poultry industry, in addition to other industrial uses and human consumption, the food and feed industry has further raised the demand for competitive prices for maize growers. Based on cross market price data, (Shah et al. 2014) reported that the integration of the maize market, price signals and Punjab maize production center in the Lahore market to communicate well. They also stressed that the maize trade depicted the trend of the past, but Pakistan has been a net exporter of maize since 2008 to 2009. The increase in production plus the stability of maize prices will help increase farmers income because of the adoption of hybrid maize. This also helps to improve the productivity of maize.

The maize crop adopted in the existing cropping pattern, the food deficiency and required nutritional intake of the low income-earning people can be overcome substantially. But the rate of adoption and sustainability of maize depends largely on its economic profitability. Since studies regarding economic profitability of maize are very few in lower region of Sindh, this study will provide valuable information that may be useful both of different levels of GOs and NGOs policy makers for formulating appropriate policy for widespread cultivation of maize. With this view in mind, the study was undertaken to know cost and return of maize cultivation in Tando Allahyar District of Sindh.

Limitation of the study

The primary data used in the study was gathered through field surveys. The sample size is constrained by time and money issues. Researchers confront a variety of challenges while collecting data. There are no written records of growers' costs and earnings due to their low literacy rates. They are reluctant to provide information about personal problems and income farm maize, and they doubt the purpose of the study, although they have explained the fact of the study. The respondents may not have reported the data on agricultural output and input, but it is not bad. In order to collect reliable information, we have adopted prudent measures. All the information collected is based on the memory and estimation of maize growers.

Material and Methods

The research was conducted using descripted in design with a structured survey approach, which involved meaningful questions about socio-economic condition and the cost and return from maize crop cultivation.

STUDY AREA

The typical method for conducting a farm management inquiry is to choose a region where the target crop is cultivated. In order to conduct the study, the Tando Allahyar district of Sindh was specifically chosen due to its higher concentration of maize production.

Selection of the sample farmers

Sample size was considered to be appropriate for achieving the study's goals. Due to time and budget constraints, it was not possible to survey every farmer. Therefore, A sample of 120 farmers was randomly selected from them for current study.

Questionnaire

The questionnaire has specific questions on the advised methods for growing the maize crop. Knowledge of farming procedures, including seed rates, cost of fertilizer needed, harvesting methods, storage, and marketing, was also integrated. To arrive at meaningful results, collected data was examined using straightforward statistical techniques including average and others.

Data analysis

The data was initially set up and coded in a system and examined using the Microsoft Excel frequencies, means, standard deviations, and ranks were determined.

a) Estimation of average

Averages were calculated by applying following formula:

Average = $\sum Xi / n$

Where;

$\sum Xi$ = sum of independent variables

n = number of observations in data

b) Total Cost of Production

Total cost of production was estimated by using the following formula:

TC=TFC+TVC

Net Returns

Net returns were estimated by using the following formula:

NR= TI- TC

d) Input-output and cost benefit ratio

The input-output ratio was estimated by using the following formula:

$$IO_R = \frac{T1}{TC}$$

Where IOR = Input-Output Ratio

The cost-benefit ratio was estimated by using the following formula:

$$CBR = \frac{NR}{TC}$$

Where CBR = Cost Benefit Ratio

RESULTS AND DISCUSSION

This chapter shows the total outcomes of the study met through investigation. This chapter describes the objectives' outcomes under different headings; the findings of this study are placed according to the objectives of the study. This chapter consists of socio-economic condition of respondents and cost and return of maize production in study area.

Socio-economic background of the respondents

In order to determine the background/socio-economic condition of the respondents, data was collected for respondents' background through the questionnaire. Data was inserted and analyzed in SPSS software for better experience; however socio-economic background of the respondents is maintained in separate tables.

Table 1 Distributions of the respondents according to their age

Details	No. of respondents	Percentage
18-20	38	31.67
21-35	35	29.17
36-50	30	25.00
50>	17	14.17
Total	120	100

The respondents' ages and the age group of maize farmers is seen in Table 1.

In the age groups of 18–20 years, 31.67 percent, 21–35 years, 29.17 percent, 36–50 years, and 50+ years, 25.00 percent respectively. Khaliq et al., (2019) conducted research to evaluate the socioeconomic features of maize producers. Maize production impacts the effectiveness of resource usage and level of profitability. The results of this study indicate that farmers have experienced less involved in maize production, most maize farmers engaged in other forms of business.

Table 2 Distribution of the respondent according to their education level

Details	No. of respondents	Percentage
Illiterate	18	15.00
Primary	56	46.67
Matriculation	38	31.67
Collage/University	8	6.67
Total	120	100

Table 2 shows the education level 15.00 per cent farmers were illiterate, 46.67 per cent maize farmers were primary level of education, 46 per cent were matriculation 31.67 and 6.67 per cent collage/ university of maize farming.

Table 3 Distributions of the respondents according to their farming experience

Details	No. of respondents	Percentage
10-20	24	20.00
21- 30	55	48.83
30>	41	34.16
Total	120	100

According to Table 3, those with up to 10–20 years of farming experience had 20 percent of the total, those with 21–30 years of farming experience had 48.83 percent, and those with more than 30 years of farming experience had 34.16 percent of the total.

Table 4 Distributions of respondents according to farm size in the study area

Details	No. of respondents	Percentage
3-8	54	45.00
9-12	36	30.00
12>	30	25.00
Total	120	100

Table 4 shows about the number of 3-8 acres were 45.00 per cent, 30.00 per cent and 25.00 per cent were 9-12 acres and 12> acres of the maize farming.

Table 5 Varieties grown of the selected farmers in the study area

Varieties grown	No. of farmers	Percent
Pak Afgoi SG-2002	32	26.67

Local OPV	28	23.33
Hybrid Highcorn 11 Plus	24	20.00
Hybrid 626	20	16.67
Hybrid Single Cross 823017/11	16	13.33
Total	120	100.00

Table 5 shows that 26.67 percentages of the respondents had Pak Afgoi SG-2002 variety, 23.33 percentages of the respondents had Local OPV variety, while hybrid varieties i.e. Hybrid Highcorn 11 Plus, Hybrid 626 and Hybrid Single Cross 823017/11 were 20.00, 16.67 and 13.33 percent, respectively grown in the study area. This preference for traditional and locally adapted varieties aligns with studies in similar agro-ecological zones, such as Ali et al. (2019), who found that Pakistani farmers often favor open-pollinated varieties (OPVs) due to their lower input costs, reliable performance under local conditions, and better resistance to biotic stresses. Similarly, Khan & Rana (2020) reported that hybrid adoption in Khyber Pakhtunkhwa remained below 30%, attributing this trend to high seed costs, limited access to quality inputs, and farmer risk aversion—factors that may also explain the moderate hybrid uptake in this study. However, these results contrast with findings from high-input agricultural systems, such as Zhang et al. (2021)'s research in China, where hybrid maize adoption exceeded 80% due to strong government subsidies, aggressive extension services, and proven yield advantages. The disparity highlights the influence of socioeconomic, institutional, and agro-climatic factors on varietal adoption. In the study region, the dominance of Pak Afgoi SG-2002 could stem from its disease resistance, stable yields, or market demand, while the lower hybrid adoption may reflect gaps in farmer awareness, affordability, or perceived risks. Future research should explore on-farm yield comparisons between these varieties and assess the socioeconomic barriers to hybrid adoption to inform targeted policy interventions.

Table 6 Distributions of the farmers according to seed rate

Seed Rate (Kg/acre)	No. of farmers	Percent	Seed rate weighted average
50	83	69.16	46.9
40	37	30.83	
Total	120	100.00	

Table 6 shows the farmers growing maize who had used seed rate 50kg per acre were 83 respondents average, while 37 respondents had used seed rate 40 kg per acre. Therefore, the weighted average of seed rate was 46.9 kg/acre. These findings align with Hussain et al. (2021), who reported that smallholder farmers in Punjab often use 50–55 kg/acre for maize, believing it ensures optimal plant density and yield stability. However, research by Ali & Rehman (2020) in similar agroecological zones demonstrated that 40–45 kg/acre could be equally productive

if high-quality seeds and precision planting methods are employed, reducing input costs without sacrificing yield. The divergence in seed rate preferences may reflect differences in seed quality, soil conditions, or risk tolerance among farmers. While the weighted average (46.9 kg/acre) falls within the commonly recommended range (40–50 kg/acre) for maize in Pakistan (PMD, 2023), the predominance of 50 kg/acre indicates potential over-seeding, which could lead to unnecessary input costs or intra-crop competition. Further investigation into germination rates, spacing practices, and yield comparisons between the two seed rates would help determine the most cost-effective approach for local farmers.

Cost and returns in maize production

Table 7 Per acre total cost of production in the study area

Particulars	**Mean**
Fixed Cost	46335.13
Labour Cost	27839.9
Marketing Cost	35054.67
Capital Inputs	42832.8
Total	152062.5

According to Table 7, the average cost of production per acre was Rs. 152062.5. This included, respectively, Rs. 46335.13 for fixed costs, Rs. 27839.9 for labour costs, Rs. 35054.67 for marketing expenses, and Rs. 42832.8 for capital inputs. According to Hina (2013), the composition's lowest seed cost (21.336 percent) and highest land rent (28.536 percent) account for the share's total cost. Pesticides have been observed to have the greatest growth rate of input cost rise over time (8.98 percent). However, the lowest recorded rate of seed input costs (4.26 percent) Rising input prices also contributed to a general negative return in 2002, 2002, 2006, and 2007.

Table 8 Per acre physical and revenue productivity in the study area

Particulars	**Obtained per acre**	**Rate per mound**	**Revenue**
Maize	745 (Mounds)	450.00	335250.00

It is evident from Table 8 that each maize producer averaged 745 mounds of grain per acre. Further results showed the income per acre received by each selected maize producer in the research region, which was Rs. 335250.00.

Table 9 Per acre net income in the study area

Particulars	**Mean**
Gross Income (Rs) A	335250.00
Total Expenditure (Rs) B	152062.5

Net Income (Rs) A-B=C	183187.5

According to Table 9, the average amount that maize farmers made per acre throughout the research was Rs. 152062.5 in total expenditures, Rs. 335250.00 in gross income, and Rs. 183187.5 in net income. This aligns with Akram et al. (2022), who reported comparable net incomes (Rs. 165,000–190,000/acre) for maize in Punjab, attributing profitability to rising market prices and improved hybrid yields. However, the high gross income contrasts with findings from Khan et al. (2021) in rainfed regions, where net incomes averaged Rs. 120,000/acre due to lower yields and higher input costs, highlighting the role of irrigation access and agro-climatic conditions in profitability. The expenditure breakdown (Rs. 152,062.5/acre) likely reflects costs of seed, fertilizer, and labor, which constitute 60–70% of maize production costs in Pakistan (PMD, 2023). While the net income appears robust, price volatility (e.g., fluctuations in maize support prices) and climate risks (e.g., heat stress during flowering) could threaten stability, as noted by Ullah et al. (2020). To enhance profitability, farmers could adopt cost-saving measures (e.g., precision nutrient management) or diversify into high-value maize products (e.g., silage for dairy). Further research should explore long-term income stability and the impact of policy interventions (e.g., subsidies, guaranteed procurement) on farmer returns.

Table 10 Per acre input-output and cost benefit ratio in the study area

Area sown	Gross Income (Rs.)	Net Income (Rs)	Total Expenditure (Rs.)	Input-output ratio	Cost benefit ratio
Acre	(A)	(B)	(C)	(A)/(C)	(B)/(C)
1	335250.00	183187.5	152062.5	1:2.20	1:1.20

The selected maize producers in the research region were shown in Table 10 to have an average gross income per acre of Rs. 335250.00 and total expenditures of Rs. 152062.5, resulting in an input output ratio of 1:2.20. The chosen maize producers in the research region had a cost benefit ratio of 1:1.20 thanks to their net acreage income of Rs. 183187.5 and total expenditures of Rs. 152062.5. According to Choudhri et al., (2018), the total cost of cultivation and gross income per hectare were both positively correlated with farm size, but the net income trend with farm size suggested that resources were not being used effectively to grow maize at larger groups of farms. Major obstacles included technical, managerial, and financial issues.

Conclusions and recommendations

The study finally concludes that maize is definitely an important crop for farmers because its yield is increasing regularly. The cost required for maize crop is low as compare to its return on one hectare, however, profit on one hectare is exceptional and beneficial for country's economy and individual betterment. The study suggests that formal education and agricultural training be offered to the farming community by the government and other interested groups. Offering

subsidies for key agricultural production inputs like hybrid seeds and chemical fertilizers, as well as price assistance throughout the harvest season, would increase producers' returns from this crop. The government should offer several educational initiatives, seminars, and workshops on the best ways to grow maize in rural areas.

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