



Economic Evaluation of Red Chilli Farming in District Mirpurkhas, Sindh, Pakistan

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Abstract

Sindh province also produces red chilli in large quantities in Pakistan with 80-88 percent national production. Mirpurkhas ranks among the largest districts producing chilli in the Province of Sindh because it is well endowed with climatic conditions as well as long experience in farming. The current research paper under consideration focuses on the economic performance of production of red chilli in the District of Mirpurkhas, Sindh. The data collection methods were random sampling and a structured questionnaire, and primary data were collected from 60 red chilli growers. The findings showed that the crop was producing on average 75.00 Mds per acre, and the gross income per acre was Rs. 160,000 and cost of production was Rs. 71,550 that provided a net income of 88, 450 per acre. It was



found that the input-output ratio was 1: 2.24 which meant that each rupee invested generated 2.24 in gross returns. The ratio cost to benefits was found to be 1:1.24 that validates the fact that the red chilli production is a lucrative venture in the study area.

Keywords: Red Chilli, Cost of Production, Input–Output Ratio, Profitability, Pakistan

1. Introduction

Red chilli (*Capsicum annum L.*) is one of the most valuable spice and cash crop produced in Pakistan. It is commonly employed in domestic cooking and food processing sector because it is pungent as well as in color and taste. Besides being a culinary ingredient, chilli also has some industrial uses, namely, pharmaceutical and cosmetic products. Chilli is also one of the most traded spices at the global level with India, China, and Mexico being the major producers. Pakistan is also a significant producer and exporter of chilli and especially in the South Asian region (Hussain & Shah, 2023). In Pakistan, the red chilli production is concentrated in Sindh province which produces almost 85-90 percent of the national output. Significant areas with chilli crop are Dadu, Umerkot and Mirpurkhas which constitute the main chilli-growing region in the country. These districts are very favorable in terms of agro-climatic conditions, presence of irrigation facilities, and experience of farmers which makes them very favorable in the production of chilli (Ahmed & Qureshi,2022).

Sindh is an area that yields about 80,000-90,000 tonnes of red chilli on an estimated area of 38,000-40,000 hectares. The large rural population in Chilli farming offers a source of employment to the people, and acts as a significant source of farm income. Varieties that are commonly cultivated in the province are Maxi, Desi and the hybrid varieties like Red Sky that are slowly being embraced by producers owing to the fact that they yield more and are resistant to diseases. Nutritionally, chilli is also a good source of vitamins A, C, and E with antioxidant and medicinal properties (Ali and Memon, 2021).

The production of chilli in Pakistan has not been as high as it can be despite its economic potential. There are various factors that limit productivity such as the application of traditional farming methods, poor access to quality seed, inequality in application of fertilizer and inadequate availability of institutional credit. Pest and disease control, in some cases, viral and fungal attacks also decrease yields and profitability of farm (Khan and Baloch, 2022).

Chilli growers also face serious problems in post-harvest handling. The majority of farmers are using the time-consuming traditional methods of sun-drying that lead to a loss of quality, weight, and even color. The practices subject the crop to contamination and damages by pests which eventually decrease market value. The losses in production of chilli which includes improper method of drying, storing, and grading are estimated at 15-20 percent (PHDEC, 2024) (Hussain & Shah, 2023).

Chilli production in Sindh is further marked with uncertainty brought about by the environmental and climatic conditions. Chilli needs an average temperature of 24C-32C, but over the past few years, the increasing temperatures, heat waves and erratic supply of water have negatively impacted on the crop performance. The fact that the canal irrigation is not predictable leads to water scarcity, which, in turn, impacts small farmers who have no access to other sources of water (Zhang and Farooq, 2023). Farmer returns are also restricted by market-related problems. Most growers are selling their produce at the farm gate via the middlemen as they have no organized wholesale markets and have poor marketing infrastructure to market their produce, hence low farm-level prices. Prices are seasonal and not linked to the market well: this fact discourages investment in better production technologies (Rais et al., 2023)

The growing of Chilli is a key investment in rural Sindh and Pakistan in general. It also has a high possibility of growing its export earnings by the addition of values, especially the processing of chilli into products like oleoresin and powdered chilli. Nevertheless, to achieve this potential, there are critical factors such as low productivity, post-harvest losses, risks associated with the climate, and a weak marketing system that should be mitigated. These problems should be intensified in future research and made priority in future agricultural and policy planning activities (FAO, 2023; GOP, 2024).

2. Objectives

1. To examine the socio-economic profile of the farmers of red chilli in the research area.
2. To determine the estimated cost of production per acre of chilli incurred by farmers.
3. To determine the acre yields of red chilli received by farmers.
4. To estimate input /output ratio and cost/ benefit ratio of production on red chilli.

3. Methodology

This study analyzed the Economics of red chilli production in Sindh District Mirpurkhas. In order to attain the goals of the research, a strategy was planned to base it on the nature of the agro-climatic conditions of the region, the primary chilli growing areas that are the talukas and the sample size. It is hence necessary to clarify these variables to make the study scientific, relevant, and purposeful.

3.1 Data collection

Primary data were gathered using a well-developed questionnaire to get the information regarding the red chilli production. The sampling method employed to select the respondents in the study area in Mirpurkhas, District Sindh involved a random sampling method. There were 60 red chilli growers who were chosen and evenly distributed to various farming regions in the district to cover the representative area.

3.2 Estimation of land inputs

For the estimation of land inputs for red chilli on the sample farms, the following formula was applied:

$$FIP = AF (AF \times CR) + AI + RUI / AF$$

Where:

FIP = Farm input cost per unit area of red chilli (Rs/acre)

AF = Area of farm under red chilli cultivation (acres)

CR = Contract rent per acre (Rs)

AI = Annual irrigation or fixed infrastructure costs (Rs)

RUI = Recurrent utility and incidental expenses (Rs)

3.3 Estimation of labour cost

The extent of labour input for various cultural operations involved in red chilli production was estimated using the following formula:

$$FIW = AF (MWD \times WR) + (BWD \times WRB) / AF$$

Where:

FIW = Labour cost per unit area of red chilli (Rs/acre)

MWD = Total man-work days used for land preparation, sowing, weeding, irrigation, harvesting, and drying

WR = Average wage rate for male labour (Rs/day)

BWD = Total woman-work days involved in operations such as transplanting, picking, and sorting

WRB = Average wage rate for female labour (Rs/day)

AF = Area under red chilli cultivation (acres)

3.4 Estimation of capital inputs

The per-unit cost of capital inputs for red chilli farming was estimated using the following formula:

$$\text{CIPU} = (\text{QS} \times \text{PR}_s) + (\text{QF} \times \text{PR}_f) + (\text{QP} \times \text{PR}_p) / \text{AF}$$

Where:

CIPU = Capital input cost per unit area of red chilli (Rs/acre)

QS = Quantity of seed used (kg/acre)

PR_s = Price per unit of seed (Rs/kg)

QF = Quantity of fertilizer applied (kg or bags/acre)

PR_x = Price per unit of fertilizer (Rs/kg or Rs/bag)

QP = Quantity of pesticides used (litres or kg/acre)

PR_p = Price per unit of pesticide (Rs/litre or Rs/kg)

AF = Area under red chilli cultivation (acres)

3.5 Marketing cost

The marketing cost was estimated by using the following formula:

$$\text{Mc} = \text{Qm} (\text{RL} + \text{Tr} + \text{RuL}) / \text{As}$$

Where:

Mc = Marketing cost

Qm = Quantity of produce marketed

RL = Rate of loading

Tr = Transportation rate

RuL = Rate of unloading of red chilli

Af = Area farm

3.6 Estimation of returns

The estimation of returns was developed by using the following formula:

$$\text{VP} = (\text{Qs} \times \text{Pr}) / \text{As}$$

Where:

VP = Value of product

QS = Quantity Sold

Pr = Price per unit.

3.7 Total cost of production

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

$$TC = TFC + TV$$

Where:

TC = Total cost of production

3.8 Net returns

The net returns were estimated by using the following formula

$$NR = TI - TC$$

Where:

NR = Net returns

TI = Total income

TC = Total cost

4. Results

This chapter shows the findings of the research, such as socio-economic aspects of the chilli farmers, production and the difficulties that are experienced in District Mirpurkhas. The analysis and interpretation of data collected on sampled farmers were done to answer research objectives. These results are used to generalize and policy proposals that would result in a better production of chilli and profitability for the farmers.

4.1 Age

Table 1: Age Distribution of Farmers

Age of Respondents	No. of Farmers	Percentage
Young (< 30)	14	23.33%

Middle aged (30–50)	30	50.00%
Old (> 50)	16	26.67%
Total	60	100.00%

Table-1 shows that 50.00% of the red chilli respondents were middle aged, followed by 26.67% old and 23.33% young. It means that most of the respondents belonged to the middle age category.

4.2 Literacy Level

Table 2: Educational Status

Literacy Level	No. of Farmers	Percentage
Illiterate	12	20.00%
Primary	22	36.67%
Middle	16	26.67%
Matric & above	10	16.66%
Total	60	100.00%

Table-2 shows that 36.67% of the red chilli respondents had primary education, followed by 26.67% middle, 20.00% illiterate and 16.66% matric and above. It means that most respondents had basic literacy levels.

4.3 Farming Experience

Table 3: Farming Experience (Years)

Experience	No. of Farmers	Percentage
Up to 10	12	20.00%
11–20	18	30.00%
21–30	21	35.00%
Above 30	9	15.00%
Total	60	100.00%

Table-3 shows that 35.00% of the red chilli respondents had 21–30 years of farming experience, followed by 30.00% with 11–20 years, 20.00% up to 10 years and 15.00% above 30 years. It means that many farmers had considerable experience which influences production decisions.

4.4 Type of Tenure

Table 4: Farm Ownership Type

Tenure Type	No. of Farmers	Percentage
Owner	26	43.33%
Tenant	34	56.67%
Total	60	100.00%

Table-4 shows that 56.67% of the red chilli respondents were tenants, while 43.33% were owners. It means that more than half cultivate on rented land.

4.5 Total Area of Land

Table 5: Farm Size Distribution

Land Size (acres)	No. of Farmers	Percentage
Up to 10	25	41.67%
11–20	20	33.33%
Above 20	15	25.00%
Total	60	100.00%

Table-5 shows that 41.67% of the red chilli respondents had land up to 10 acres, followed by 33.33% with 11–20 acres and 25.00% above 20 acres. It means that farms are predominantly small to medium-sized.

4.6 Annual Net Income

Table 6: Annual Income from Chilli

Annual Income (Rs)	No. of Farmers	Percentage
Up to 120,000	20	33.33%
120,001–180,000	18	30.00%
180,001–240,000	14	23.34%
Above 240,000	8	13.33%
Total	60	100.00%

Table- 6 shows that 33.33% of the red chilli respondents earned up to Rs. 120,000 annually from chilli, followed by 30.00% earning Rs. 120,001–180,000, 23.34% earning Rs. 180,001–240,000 and 13.33% earning above Rs. 240,000. It means that most farmers were clustered in the lower to middle income brackets from chilli.

4.7 Cultivation Pattern

Table 7: Cultivation Method

Cultivation Method	No. of Farmers	Percentage
Transplanted	16	26.67%
Direct Sowing	44	73.33%
Total	60	100.00%

Table-7 shows that 73.33% of the red chilli respondents practiced direct sowing, while 26.67% used transplanting. It means that direct sowing was the dominant cultivation method.

4.8 Varieties Grown

Table 8: Chili Varieties

Variety	No. of Farmers	Percentage
Maxi/Local	18	30.00%
Desi	16	26.67%
Nageena	14	23.33%
Hybrid (e.g. Red Sky)	12	20.00%
Total	60	100.00%

Table-8 shows that 30.00% of the red chilli respondents cultivated Maxi/Local varieties, followed by 26.67% Desi, 23.33% Nageena and 20.00% Hybrid (e.g., Red Sky). It means that traditional varieties were still dominant with gradual hybrid adoption.

4.9 Distance from Market

Table 9: Proximity to Market

Distance	No. of Farmers	Percentage
Up to 10 km	18	30.00%

11–20 km	22	36.67%
21–30 km	12	20.00%
Above 30 km	8	13.33%
Total	60	100.00%

Table-9 shows that 36.67% of the red chilli respondents were located 11–20 km from markets, followed by 30.00% within 10 km, 20.00% at 21–30 km and 13.33% above 30 km. It means that most farms were within 20 km of suitable markets.

4.10 Preservation Duration

Table 10: How Long Chillies Are Stored

Duration	No. of Farmers	Percentage
Up to 1 week	10	16.67%
1–2 weeks	30	50.00%
More than 2 weeks	20	33.33%
Total	60	100.00%

Table-10 shows that 50.00% of the red chilli respondents preserved chilli for 1–2 weeks, followed by 33.33% for more than 2 weeks and 16.67% up to 1 week. It means that most farmers stored produce for short durations due to limited cold storage.

4.11 Preservation Methods

Table 11: Preservation Practices

Method	No. of Farmers	Percentage
Sun drying	42	70.00%
Mechanical drying	18	30.00%
Total	60	100.00%

Table-11 shows that 70.00% of the red chilli respondents used sun drying, while 30.00% used mechanical drying. It means that sun drying remained the major preservation method with some shift to improved techniques.

4.12 Yield per Acre

Table 12: Yield Distribution

Yield (kg/acre)	No. of Farmers	Percentage
1500	12	20.00%
2000	20	33.33%
2500	18	30.00%
Above 2500	10	16.67%
Total	60	100.00%

Table-12 shows that 33.33% of the red chilli respondents harvested 2,000 kg per acre, followed by 30.00% with 2,500 kg, 20.00% with 1,500 kg and 16.67% above 2,500 kg. It means that average yield was around 2.2 tonnes per acre.

4.13 Fixed Cost

Table 13: Fixed Costs

Particular	Mean (Rs/acre)	S.D. Error
Land Tax	600	1.00
Land Rent	24,000	150.00
Total	24,600	150.50

Table-13 shows that the average fixed cost per acre was Rs. 24,600, comprising Rs. 600 land tax and Rs. 24,000 land rent. It means that land rent was the major fixed cost component.

4.14 Inputs Cost

Table 14: Capital Inputs

Particular	Mean (Rs/acre)	S.D. Error
FYM	4,500	150.00
Seed	2,100	50.00
Seed Treatment	350	20.00
Fertilizer	6,800	60.00
Pesticide	6,400	100.00
Total	20,150	200.00

Table-14 shows that the average input cost per acre was Rs. 20,150, including Rs. 6,800 for fertilizer, Rs. 6,400 for pesticides, Rs. 4,500 for FYM, Rs. 2,100 for seed and Rs. 350 for seed treatment. It means that fertilizer and pesticides were the largest input expenses.

4.15 Nursery Labour

Table 15: Nursery Labour

Particular	Mean (Rs/acre)	S.D. Error
Bed Prep & Sowing	350	15.00
Fertilizer Application	520	20.00
Hand Weeding	350	15.00
Total	1,220	50.00

Table-15 shows that nursery labour cost per acre was Rs. 1,220, which included Rs. 520 for fertilizer application, Rs. 350 for bed preparation & sowing and Rs. 350 for hand weeding. It means that fertilizer application was the highest nursery labour component.

4.16 Labour Cost

Table 16: Field Labour

Activity	Mean (Rs/acre)	S.D. Error
Dry Ploughing	2,300	30.00
Clod Crushing	2,000	25.00
Weeding	350	10.00
Inter Cultivation	1,700	20.00
Fertilizer Application	700	15.00
Spreading FYM	700	15.00
Marking	700	15.00
Planting Seedlings	350	10.00
Spraying Pesticide	700	10.00
Watch & Ward	800	25.00
Harvesting/Cutting	6,000	60.00

Total	16,300	250.00
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Table- 16 shows that the total field labour cost per acre was Rs. 16,300, with the highest share from harvesting/cutting (Rs. 6,000), followed by dry ploughing (Rs. 2,300) and clod crushing (Rs. 2,000). It means that harvesting was the most labour-intensive activity.

4.17 Marketing Cost

Table 17: Marketing Expenses

Activity	Mean (Rs/acre)	S.D. Error
Loading	2,300	2.00
Transportation	6,000	100.00
Unloading	2,200	2.00
Total	10,500	104.00

Table-17 shows that the average marketing cost per acre was Rs. 10,500, comprising Rs. 6,000 for transportation, Rs. 2,300 for loading and Rs. 2,200 for unloading. It means that transportation was the major marketing expense.

4.18 Total Cost of Production

Table 18: Total Cost per Acre

Particular	Mean (Rs/acre)	S.D. Error
Fixed Cost	24,600	150.50
Inputs Cost	20,150	200.00
Labour Cost	16,300	250.00
Marketing Cost	10,500	104.00
Total	71,550	704.50

Table-18 shows that the total cost of production per acre was Rs. 71,550, comprising Rs. 24,600 fixed costs, Rs. 20,150 input cost, Rs. 16,300 labour cost and Rs. 10,500 marketing cost. It means that fixed and input costs together formed the largest share of total cost.

4.19 Physical Productivity

Table 19: Physical Yield (Maunds/acre)

Particular	Mean (maunds)/acre	S.D. Error
Chilli	75.00	2.50

Table 19 shows that the average physical productivity of chilli was 75.00 maunds per acre with S.D. error of 2.50. It means that farmers achieved approximately 2.1 tonnes per acre due to improved practices.

4.20 Revenue per Acre

Table 20: Revenue Productivity

Particular	Mean (Rs/acre)	S.D. Error
Value of Output	160,000	300.00

Table-20 shows that the average revenue productivity per acre was Rs. 160,000 with S.D. error 300.00. It means that chilli generated strong gross returns per acre.

4.21 Net Farm Income

Table 21: Net Income

Particular	Mean (Rs/acre)	S.D. Error
Gross Income (A)	160,000	300.00
Total Cost (B)	71,550	704.50
Net Income (A-B)	88,450	—

Table-21 shows that the net income per acre was Rs. 88,450, obtained by subtracting total cost (Rs. 71,550) from gross income (Rs. 160,000). It means that chilli cultivation was profitable for most growers.

4.22 Input-Output Ratio

Table 22: Input-Output Ratio

Acre	Gross Income	Total Cost	Output/Input Ratio
1	160,000	71,550	1: 2.24

Table-22 shows that the input-output ratio per acre was 1: 2.24, indicating that each rupee spent generated Rs. 2.24 in gross income. It means that chilli production was economically efficient.

4.23 Cost–Benefit Ratio

Table 23: Cost–Benefit Ratio

Acre	Net Income	Total Cost	Cost–Benefit Ratio
1	88,450	71,550	1: 1.24

Table-23 shows that the cost–benefit ratio per acre was 1: 1.24, indicating that each rupee of cost yielded Rs. 1.24 in net benefit. It means that chilli cultivation provided a favourable return over cost.

5. Conclusions and Suggestions

The yield and profitability of red chilli farmers in District Mirpurkhas have both increased. Higher net returns, better agricultural management, and more job opportunities in rural areas have all resulted from the production of red chillies. The results demonstrate that productivity, yield, and farm income can all be further raised by utilizing more effective production techniques. Nonetheless, many farmers continue to use conventional production methods and apply improper input combinations. Therefore, to improve chilli production, modern agronomic practices should be promoted through improved training and education.

Irrigation is another important issue, and the government must ensure that irrigation water is delivered in a timely and adequate manner in order to reduce water shortages in the study area. Farmers should be trained in the equitable and proper use of inputs in order to boost productivity. Additionally, subsidies for premium seeds, fertilizer, pesticides, and other crop protection supplies ought to be provided to them. Better market facilities, farmer-friendly laws, and facilities for drying and cold storage should all be implemented in order to lower marketing barriers for producers. The production of red chillies also requires a comprehensive and up-to-date production and post-harvest management manual. These guidelines should be developed and distributed by agricultural extension services and research organizations.

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