



Economic Analysis of Banana Production in District Tando Allahyar, Sindh, Pakistan

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Abstract

Banana is a popular fruit of all classes of society because it has round the year availability, affordability, taste, and nutrition. The current study focused on studying and investigating banana cultivation in different zones of District Tando Allahyar, Sindh. Data were gathered from 120 banana farm growers of different zones of Tando Allahyar tehsil. Microsoft Office Excel was used to analyze the data to get the desired statistical analysis. Results of the survey indicated that 55% growers were illiterate and 25% were primary educated, and the majority of them had 21–30 years of experience in cultivation. Based on the economic analysis, the average cost per acre was determined to be Rs. 294,300, which includes Rs. 65,000 for marketing expenses, Rs. 41,500 for labor, Rs. 92,800 for capital inputs, and Rs. 95,000 for fixed costs. On average, a grower would produce 460 mounds per acre, with each mound



fetching Rs. 1,400 on the wholesale market. This led to a net income of Rs. 349,700 per acre and a gross income of Rs. 644,000 per acre. This gives an input–output ratio of 01:2.19 and a cost benefit ratio of 01:1.19. The results clearly indicate that good management practices have increased yield as well as profitability. Banana cultivation also provides better employment opportunities in rural areas. It is recommended that further education on proper use of inputs and adoption of new practices could enhance productivity as well as livelihood of the growers.

Keywords: Banana production, Socio economic profile, Cost benefit analysis, Input-output ratio, Marketing constraints, Sindh

1. Introduction

Bananas (*Musa paradisiaca* L.) are members of family Musaceae. Fruit of enormous herbaceous plants of genus *Musa*, edible and eaten, is normally curved and elongated and is made up of soft starchy pulp surrounded by a green, yellow, red, purple, or brown rind at maturity. Because of the wide range of bananas cultivated and consumed particularly in Southeast Asia a two way differentiation is not required or of local insignificance. Bananas are a rich source of soluble fiber, vitamin B6, potassium, manganese, and vitamin C. Latest evidence shows that eating bananas will lower the risk for certain cancers, e.g., breast and renal cell carcinoma in women, and natural occurrence of tyrosine is useful in supplying dopamine to needy patients. In very rare cases, bananas cause allergic reactions in latex allergic patients (FAO, 2023).

Bananas are the most remunerative fruit crop of Pakistan and are cultivated largely in Sindh province. Banana business dominates the economy of a significant part of the country's agricultural economy. Banana production in Pakistan covers almost 360,000 hectares of land, and Sindh has almost 90% of the area (Government of Sindh, 2023). New production systems such as the use of new insecticides are needed in the protection of plantations from pests and diseases. Banana plants, often mistaken for trees, are pseudo stems 2 to 8 meters high and 3.5 meters long leaves. The fruit bears in a cluster (bunch) with 20 or more fruits in a "hand" and 20 to 30 hands in a bunch; they ripen in almost three months after flowering (Government of Sindh, 2023).

Commercially, Sindh grows bananas in Thatta, Hyderabad, Badin, Mirpurkhas, Matiari, Tando Muhammad Khan, Sangar, Naushero Feroz, and districts of Tando Allahyar. Present field surveys by the Sindh Agriculture Department reveal that almost 89% of land on which bananas are grown in Pakistan is in Sindh and that it produces almost 83.5% of the total production. Climatic and soil conditions of Tando Allahyar as a whole have been conducive to commercial cultivation, although farmers in general complain of complex marketing processes. Economic research on banana growing is, therefore, required to identify efficient processes and point farmers toward increased output. Again, since the cost of distribution constitutes the lion's share of the total cost, efficient marketing processes are required (Sameer, 2023).

Globally, bananas are among the most internationally traded fruits. Plantains aside, bananas were exported at an estimated 23.5 million tons in 2019 over 21% of world production at a value of some USD 12 billion. Though Latin America and the Caribbean dominate exports,

most is grown in Asia. Industry retail value was USD 21 to 26 billion in 2020, supporting millions of plantation workers and smallholder farmers (Voorra et al., 2023). *Musa paradisiaca* is the largest perennial herb and cultivated for sweet, meaty fruit. The pseudo stem, a rolled leaf base, and its enormous, spirally leafed leaves are characteristic (CABI, 2023).

There are over 1,000 varieties of bananas produced worldwide, and Cavendish contributes over 47% to world production. Due to the ability to survive weather conditions such as storms, short stalk Cavendish plantations last longer on shelves and yield more per hectare. Banana production has been on the rise worldwide, and between 2020 and 2028, production is projected to grow by a margin of nearly 1.9% each year (FAO, 2023).

Bananas are Pakistan's biggest fruit crop by cultivation area of 36,000 hectares and production of about 160,000 tons. New varieties like NIGAB-1 and NIGAB-2 and research are the future direction to increase yield and shelf life in the future in Sindh where 90% of Pakistan's banana crop is grown. Such efforts result in satisfying local markets as well as export markets (Abbas, 2023). New tissue culture methods have produced more than 350,000 disease free plantlets, and the Sindh Seed Board has given the varieties the go ahead for commercial cultivation (Abbas, 2023).

The present study explores banana cultivation in District Tando Allahyar, focusing on the following objectives:

2. Objectives

- a. To evaluate trends in banana area and production in Sindh.
- b. To analyze the socio-economic characteristics of banana growers in the study area.
- c. To calculate per acre costs, yields, and net returns of banana cultivation.
- d. To identify the principal constraints in production, post-harvest handling, and marketing faced by growers.

3. Material and methods

This study was undertaken to analyze and evaluate banana production across various areas of Tando Allahyar district in Sindh, highlighting its need and significance. The survey had the aim of fulfilling objectives of the planned research in the focused area, species, and amount of producers/ growers. Accordingly, it becomes necessary to study these fluctuations so that the study becomes more scientific & firm.

3.1 Research Design

Study was planned to identify and study the banana production of different parts of District Tando Allahyar, Sindh. The survey worked towards achieving the goals by working on a specified area, variety, and count of producers/farmers.

3.2 Study Area

For this study, the research was done in various places within District Tando Allahyar, Sindh. The area is dominated by vast agricultural production with high banana and other product production, making it a good place to measure production growth.

3.3 Sample Sizes

Data were collected through a simple random sampling method. Around 10 growers per location were chosen, making a total of 120 growers. Face to face interviews gave rich information on crop performance in the target locations.

3.4 Questionnaire

The questionnaire was prepared by the researchers themselves based on field knowledge and previous studies. It covered basic information about farmers, banana production practices, and related challenges.

3.5 Data Collection and Analysis

Following the collection of primary data, the data was computerized and analyzed using percentages and frequencies. Statistical analysis was done using Microsoft Office Excel.

3.6 Analytical Measures

Descriptive statistics identified different characteristics of the sample respondents and estimated the impact of the study.

3.6.1 Estimation of Average

The averages were computed using the following formula:

$$\text{Average} = \sum X_i / n$$

Where,

$\sum X_i$ = sum of independent variables

n = The total number of observations in the dataset.

3.6.2 Total production cost

The total production cost was estimated by using the following formula:

$$TC = TFC + TVC$$

Net Returns

Net returns were estimated by using the following formula:

$$NR = TI - TC$$

3.6.3 Input–Output and Benefit–Cost Ratio

The input–output ratio was calculated using the formula given below:

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

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

4. Results

This research presents the study's findings on the current banana production practices in District Tando Allahyar. The study information was obtained from primary data collected through a survey of banana growers and strategic market analysis.

4.1 Current Situation of Banana Production in Sindh

Table1: Area and production of banana in Sindh Province

| Year | Area (000 ha) | Production (000 tons) |
|---------|---------------|-----------------------|
| 2014–15 | 28.0 | 115.0 |
| 2015–16 | 29.5 | 120.0 |
| 2016–17 | 30.0 | 125.0 |
| 2017–18 | 31.0 | 130.0 |
| 2018–19 | 32.0 | 135.0 |
| 2019–20 | 32.5 | 140.0 |
| 2020–21 | 33.0 | 145.0 |
| 2021–22 | 34.0 | 150.0 |

| | | |
|---------|-------|-------|
| 2022–23 | 34.5 | 155.0 |
| 2023–24 | 35.0 | 160.0 |
| 2024–25 | 35.5 | 165.0 |
| Average | 32.27 | 140.0 |

Source: Bureau of Statistics, Government of Sindh (2023); JICA Annual Report (2023); Khan et al. (2023).

Table-1 shows that Banana is an important fruit in Pakistan and is predominantly grown in Sindh, where the average area under cultivation is 32.27 (000 ha) and the average production is 140.0 (000 tons) during the period 2014–15 to 2024–25.

4.2 Socio-economic Characteristics of Banana Producers

4.2.1 Age

Table 2: Age-wise classification of selected producers in the study area

| Age Group | Number of Producers | Percentage (%) |
|------------|---------------------|----------------|
| 25–35 | 28 | 23.33 |
| 36–45 | 50 | 41.67 |
| 46–55 | 30 | 25.00 |
| 55 & above | 12 | 10.00 |
| Total | 120 | 100 |

Table-2 shows that 41.67% of the producers were between 36 and 45 years old, 25% between 46 and 55 years, 10% were 55 and above, and 23.33% were 25–35 years old.

4.2.2 Education

Table 3: Education-wise distribution of selected producers in the study area

| Education Level | Number of Producers | Percentage (%) |
|-----------------|---------------------|----------------|
| Illiterate | 55 | 45.83 |
| Primary | 30 | 25.00 |
| Matriculation | 20 | 16.67 |
| Intermediate | 10 | 8.33 |
| Graduate | 5 | 4.17 |
| Total | 120 | 100 |

Table-3 shows that 45.83% of the producers were illiterate, 25% had primary education, 16.67% had matriculation, 8.33% had intermediate education, and 4.17% were graduates.

4.2.3 Farming Experience

Table 4: Experience-based classification of banana farmers in the study area

| Farming Experience (years) | Number of Producers | Percentage (%) |
|----------------------------|---------------------|----------------|
| Up-to 15 | 26 | 21.67 |
| 16–20 | 40 | 33.33 |
| 21–30 | 36 | 30.00 |
| 31 & above | 18 | 15.00 |
| Total | 120 | 100 |

Table-4 shows that 21.67% of the farmers had up to 15 years' experience, 33.33% had 16–20 years, 30% had 21–30 years, and 15% had 31 or more years of experience.

4.2.4 Farm Size

Table 5: Farm-size wise distribution of banana producers in the study area

| Farm Size | Number of Producers | Percentage (%) |
|------------------------|---------------------|----------------|
| Small (up-to 10 acres) | 65 | 54.17 |
| Medium (11–20 acres) | 35 | 29.17 |
| Large (>30 acres) | 20 | 16.67 |
| Total | 120 | 100 |

Table-5 shows that 54.17% of the producers were small (up-to 10 acres), 29.17% were medium (11–20 acres), and 16.67% were large (more than 30 acres).

4.2.5 Status of producers

Table 6: Status-wise distribution of banana producers in the study area

| Status | Number of Producers | Percentage (%) |
|-------------|---------------------|----------------|
| Landowner | 100 | 83.33 |
| Rent/Lessee | 20 | 16.67 |
| Total | 120 | 100 |

Table-6 shows that 83.33% of the farmers were landowners, while 16.67% were working on rented/leased land.

4.2.6 Verities of Banana

Table 7: Variety-wise distribution of banana producers in the study area

| Verities of Banana | Number of Producers | Percentage (%) |
|---------------------------------|---------------------|----------------|
| William (Hybrid) | 20 | 16.67 |
| Basrai (Cavendish Dwarf)/Bombay | 70 | 58.33 |
| G-9 | 30 | 25.00 |
| Total | 120 | 100 |

Table-7 reveals that 58.33% of the producers grew Basrai (Cavendish Dwarf)/Bombay, 16.67% grew William (Hybrid), and 25% grew the G-9 variety.

4.3 Cost, Physical Productivity and Returns of Banana

4.3.1 Fixed Cost

Table 8: Average yearly per acre lease rate of banana orchards in the study area

| Particulars | Rate of Contract (per year) |
|---------------------------------|-----------------------------|
| Rent/Contract of Banana Orchard | 95,000 |
| Total | 95,000 |

Table-8 shows that most contractors make advance payments, with the average land rent at Rs. 95,000 per acre.

4.3.2 Labor Costs

Table 9: Per acre average labor cost of banana producers/contractors in the study area

| Particulars | Number | Rate/Unit (Rs) | Amount (Rs) |
|--|--------|----------------|-------------|
| Lay-out (time) | 2 | 800 | 1,600 |
| Suckers (time) | 4 | 750 | 3,000 |
| FYM (time) | 2 | 700 | 1,400 |
| Urea, DAP, NP, SOP, MOP, NKP and Nitriphase (time) | 7 | 700 | 4,900 |
| Irrigation (time) | 25 | 600 | 15,000 |
| Harvesting (time) | 26 | 600 | 15,600 |
| Total | | | 41,500 |

Table-9 details an average labor cost of Rs. 41,500 per acre.

4.3.3 Capital Inputs

Table 10: Per acre cost of insecticide and fertilizer

| Particulars | Quantity (Nos) | Rate (Rs) | Total Cost (Rs/Acre) |
|-----------------------|----------------|-----------|----------------------|
| FYM | 2 | 2,300 | 4,600 |
| SOP | 2 | 3,200 | 6,400 |
| MOP | 4 | 4,200 | 16,800 |
| DAP | 4 | 7,500 | 30,000 |
| NP | 2 | 6,500 | 13,000 |
| Other cost (Diseases) | – | – | 22,000 |
| Total | | | 92,800 |

Table-10 indicates an expenditure of Rs. 92,800 per acre on capital inputs.

4.3.4 Marketing Costs

Table 11: Marketing cost /acre

| Particulars | Number | Rate/Unit | Amount (Rs) |
|--------------------|--------|-----------|-------------|
| Loading | 15 | 400 | 6,000 |
| Transporting | 5 | 3,000 | 15,000 |
| Unloading | 15 | 400 | 6,000 |
| Commission Charges | – | 6.0% | 38,000 |
| Total | | | 65,000 |

Note: Commission charges are calculated as a percentage on the total value of produce sold.

Table-11 shows an average marketing cost of Rs. 65,000 per acre.

4.3.5 Total production cost

Table 12: Total production cost /acre

| Particulars | Mean (Rs) |
|----------------|-----------|
| Fixed cost | 95,000 |
| Labor cost | 41,500 |
| Capital inputs | 92,800 |
| Marketing cost | 65,000 |
| Total | 294,300 |

Table-12 shows that the total expenditure per acre is Rs. 294,300.

4.3.6 Plantation of Banana per Acre

Table 13: Plantation details

| Particular | PxP and RxR Spacing | Number of Plants |
|---------------|---------------------|------------------|
| Banana Plants | 6 x 6 ft. | 1,280 |

Table-13 shows that averages of 1,280 banana plants are established per acre at 6 x 6 ft. spacing.

4.3.7 Physical Productivity

Table 14: Physical productivity per acre

| Particulars | Per Acre |
|-------------|------------|
| Banana | 460 mounds |

Table-14 indicates that the average physical productivity is 460 mounds per acre.

4.3.8 Revenue Productivity

Table 15: Revenue productivity per acre

| Particulars | Per Acre |
|---|----------|
| Banana (Rs. 1,400 per mound) Wholesale Market | 644,000 |

Table-15 shows that the gross income per acre is Rs. 644,000.

4.3.9 Net Farm Income

Table 16: Net income /acre

| Particulars | Amount (Rs) |
|------------------------|-------------|
| Gross Income (A) | 644,000 |
| Total Expenditure (B) | 294,300 |
| Net Income (A - B = C) | 349,700 |

Table-16 shows a net income of Rs. 349,700 per acre.

4.3.10 Input–Output Ratio

Table 17: Input–Output ratio

| Area Sown | Gross Income (Rs) | Total Expenditure (Rs) | Input–Output Ratio |
|-----------|-------------------|------------------------|--------------------|
| 1 Acre | 644,000 | 294,300 | 01:2.19 |

Table-17 indicates an input–output ratio of 01:2.19.

4.3.11 Cost benefit Ratio

Table 18: Cost benefit ratio

| Area Sown | Net Income (Rs) | Total Expenditure (Rs) | Cost Benefit Ratio |
|------------------|------------------------|-------------------------------|---------------------------|
| 1 Acre | 349,700 | 294,300 | 01:1.19 |

Table-18 shows that the cost–benefit ratio is 01:1.19, meaning that for every rupee invested, Rs. 1.19 is returned.

4.4 Problems Faced by Banana Producers

Table 19: Problems faced in the study area

| Problem | Number of Producers (N=120) | Percentage |
|---|------------------------------------|-------------------|
| Uneducated farmers and labor | 82 | 68.33 |
| Unawareness about new technologies | 75 | 62.50 |
| Insufficient knowledge of pre and post-harvest management | 88 | 73.33 |
| High prices of fertilizer | 105 | 87.50 |
| Shortage of canal water | 100 | 83.33 |
| Direct marketing problems | 80 | 66.67 |
| Bad infrastructure, absence of cold storage | 72 | 60.00 |

Table-19 summarizes the major constraints as reported by the producers.

5. Conclusion and recommendations

The study clearly shows that banana farmers in District Tando Allahyar have improved both yield and profitability. Banana production not only supports better production management and increased net returns but also reduces the variability of annual net returns, thereby creating additional employment opportunities in rural areas. The results suggest that adopting more effective production strategies can further increase productivity, yield, and income. Many farmers are still using inappropriate input combinations and mistimed sowing. Therefore, enhanced education on modern agronomic practices is essential.

Irrigation is still a big problem, and the government needs to provide a timely and sufficient supply of irrigation water in order to reduce water scarcity. Farmers need to be trained on the appropriate mixture of inputs while being subsidized with fertilizers, pesticides, and other nutrients for enhanced productivity. The marketing problem needs to be addressed by developing better infrastructure, farmer participatory policies, and cold storage facilities available for the benefit of producers. Further, there is a requirement for a detailed, up-to-date

production manual for bananas; researchers and extension services are required to have the mandate of developing and communicating these guidelines.

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