



An Integrated Assessment of Production Economics and Marketing Margins in Guava (*Psidium Guajava L.*) Supply Chains

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Abstract: Guava (*Psidium guajava L.*) is an important tropical fruit valued for both its nutritional content and its contribution to farm income. In Pakistan, it ranks among the leading fruit crops, particularly in Sindh province. However, its economic potential remains underutilized due to low productivity, considerable post-harvest losses and inefficient marketing systems that limit returns to growers. Earlier studies in Pakistan indicate that farmers typically receive only 15–27% of the final consumer price, yet evidence integrating production economics with marketing performance is lacking for Hyderabad, a key production and distribution center supplying the Karachi market. This study examined the economics of guava production, varietal performance and marketing margins in District Hyderabad during the 2022–2023 season. A cross-sectional survey design was applied using multi-stage random sampling. Data were collected from 120 respondents, including farmers and key intermediaries, through structured interviews. Information on input use, yields, costs and prices was analyzed using descriptive statistics and standard marketing margin techniques. The findings show that guava cultivation covered 11,034 hectares, producing



154,155 tons. The Shamlo variety was most widely grown and performed better in terms of yield. On average, production required Rs. 223,075 per hectare, generating a gross income of Rs. 376,960 and a net return of Rs. 153,885, indicating moderate profitability (input–output ratio 1:1.69). Despite this, the marketing structure remains highly uneven. Farmers received only 19% of the consumer price (Rs. 669 per 40 kg crate), while the remaining share was captured by retailers (39%), wholesalers (21%), contractors (15%) and commission agents (6%). Overall, although guava farming is economically viable, inefficiencies in the marketing system substantially reduce farmer benefits. Improving collective marketing, strengthening storage and grading facilities and promoting small-scale processing could help increase producer returns and reduce losses.

Keywords: Guava marketing; marketing margins; producer share; production economics; value chain

1. Introduction

Guava (*Psidium guajava* L.), a member of the Myrtaceae family, is a widely cultivated tropical fruit valued for its adaptability, nutritional richness and commercial importance (Yousaf *et al.*, 2023). It thrives across tropical and subtropical environments and is appreciated for its characteristic flavor, aroma and high vitamin C content. Nutritionally, guava contains a high moisture content along with carbohydrates, protein and dietary fiber and provides essential minerals such as calcium, potassium and iron, as well as vitamins A, B-complex and C (Yousaf *et al.*, 2023). Due to its affordability and availability, it is commonly referred to as the “apple of the poor” (Kanwal *et al.*, 2016).

In Pakistan, guava is among the leading fruit crops, ranking fourth in economic importance after citrus, mango and dates and is primarily grown in Punjab, Sindh and Khyber Pakhtunkhwa (Azam & Shafique, 2017; Yousaf *et al.*, 2023). Despite an annual production of approximately 0.57 million tons, export performance remains minimal, accounting for only a small fraction of total production. This is largely attributed to weak post-harvest management, limited storage facilities and the fruit’s short shelf life. Consequently, an estimated 30–50% of guava production is lost annually (Yousaf *et al.*, 2023).

Previous studies in Pakistan have consistently highlighted inefficiencies in guava marketing systems. For example, Khushk *et al.* (2009) reported that most growers sold harvesting rights to contractors, receiving a relatively small share of the final market price. Similarly, Randhawa *et al.* (2014) and Hassan *et al.* (2012) observed that producers typically receive a limited proportion of the consumer price, reflecting structural imbalances within the marketing chain. Economic analyses, such as those by Khushk *et al.* (2008) and Noonari *et al.* (2016), indicate that guava cultivation can be profitable; however, productivity and returns are often affected by climatic variability and management constraints (Shaikh *et al.*, 2020).

Despite these contributions, there remains a lack of integrated studies examining production economics, varietal performance and marketing margins within a single framework,

particularly for District Hyderabad. This is important because Hyderabad not only serves as a major production area but also functions as a key marketing hub through the Qasimabad wholesale market, supplying large urban centers such as Karachi.

The present study addresses this gap by (i) assessing production status and yield variation across guava varieties, (ii) examining the socioeconomic characteristics of growers and intermediaries, (iii) analyzing production costs and profitability and (iv) evaluating marketing margins and the producer's share in the consumer price. The findings provide an evidence base for improving market efficiency, strengthening infrastructure and enhancing income opportunities for guava growers in the region.

2. Materials and Methods

2.1 Study Area

The study was carried out in District Hyderabad, Sindh, Pakistan (25.39° N, 68.37° E). Hyderabad is one of the most urbanized districts in the province, with a large proportion of its population residing in urban centers. Administratively, it comprises four talukas: Hyderabad City, Latifabad, Qasimabad and Hyderabad Rural. The region is characterized by a semi-arid climate and fertile alluvial soils influenced by the Indus River system, conditions that are well suited for guava cultivation.

A key feature of the study area is the Qasimabad wholesale fruit market, which functions as a major aggregation and distribution center for guava not only from Hyderabad but also from nearby districts such as Tando Allahyar and Mirpurkhas. This dual role as both a production and marketing hub makes Hyderabad an appropriate location for examining both farm-level economics and value chain dynamics

2.2 Research Design

A cross-sectional research design was adopted for the 2022–2023 production and marketing season. The study combined quantitative and qualitative approaches. Quantitative data were collected through structured interviews to quantify yields, costs and prices, while qualitative insights were obtained through field observations and informal discussions with stakeholders to better understand institutional arrangements, particularly the role of commission agents (Arhtis).

2.3 Sampling

2.3.1 Population and Sample Size

The study population included guava growers and all major categories of market intermediaries operating within the district. A total sample of 120 respondents (n = 120) was selected to ensure representation across the value chain. This included farmers, village collectors (Beoparis), commission agents, wholesalers and retailers.

Category	Sample Size
Farmers	50

Category	Sample Size
Village collectors (<i>Beoparis</i>)	20
Commission agents (<i>Arhtis</i>)	25
Wholesalers	25
Retailers	50
Total	120

2.3.2 Sampling Procedure

A multi-stage sampling technique was employed. First, the Qasimabad wholesale market was purposively selected due to its central role in guava trade. Second, lists of registered commission agents and wholesalers were obtained from the Market Committee to facilitate random selection. For informal actors such as *Beoparis* and retailers, respondents were initially identified through referral (snowball approach) and subsequently selected randomly within accessible groups. Finally, guava-growing villages were selected proportionally, ensuring representation of small, medium and large farm categories.

2.4 Data Collection

2.4.1 Interview Schedule

A structured questionnaire was designed and pre-tested with a small group of respondents to ensure clarity and relevance. The final instrument consisted of four sections:

- **Production characteristics:** area, yield, varieties and input use
- **Socioeconomic profile:** age, education, experience and land tenure
- **Cost and return structure:** detailed breakdown of production expenses and revenues
- **Marketing information:** prices at different stages, costs, commissions and post-harvest losses

2.4.2 Materials and Equipment

Item	Source / Manufacturer	City, Country
Urea fertilizer	Fauji Fertilizer Company Ltd.	Karachi, Pakistan
NPK 15:15:15 fertilizer	Fauji Fertilizer Company Ltd.	Karachi, Pakistan
Mancozeb 75% WP (fungicide)	Syngenta Pakistan Ltd.	Karachi, Pakistan

Item	Source / Manufacturer	City, Country
Knapsack sprayer	Stihl AG	Waiblingen, Germany
Harvesting secateurs	Felco	Switzerland
Electronic weighing scale	Ohaus	Parsippany, NJ, USA
MS Excel (version 2019)	Microsoft Corporation	Redmond, WA, USA

2.4.3 Data Collection Procedure

Primary data were collected during the peak marketing period (November 2022 to January 2023) through face-to-face interviews conducted at farms, wholesale markets and retail points. Each interview lasted approximately 20–30 minutes. Secondary information was obtained from official records, including Market Committee data and reports from the Sindh local agricultural extension offices.

2.5 Data Analysis

Data were coded and analyzed. The analysis focused on descriptive and economic evaluation rather than hypothesis testing.

2.5.1 Descriptive Statistics

Basic statistical measures such as frequencies, percentages and means were used to summarize production patterns, socioeconomic characteristics and varietal distribution.

2.5.2 Economic Analysis

The following indicators were calculated:

- **Total Cost (TC)** = Fixed Costs + Variable Costs
- **Gross Income (GI)** = Yield (kg/ha) × Price (Rs./kg)
- **Net Income (NI)** = GI – TC
- **Input-Output Ratio** = GI / TC

2.5.3 Marketing Margin Analysis (Acharya Method)

- **Price Spread (PS)** = Consumer Price – Farmer Price
- **Marketing Cost (MC)** = Transport + Loading/Unloading + Commission + Market Fee + Wastage
- **Net Marketing Margin (MM)** = Sale Price – (Purchase Price + MC)
- **Producer's Share in Consumer Rupee (PSC)** = (Farmer Price / Consumer Price) × 100

All costs, prices and margins were standardized to a **40-kg crate**.

2.6 Ethical Considerations

Participation in the study was voluntary. All respondents were informed about the purpose of the research prior to interviews and verbal consent was obtained. Confidentiality of responses was maintained and no financial incentives were provided to avoid bias in responses.

3. Results

3.1 Production Status

3.1.1 Area and Production

During the 2022–2023 season, guava cultivation in District Hyderabad covered 11,034 hectares, yielding a total of 154,155 tons. Production trends over the past five years have shown fluctuations, peaking in 2021–2022 and experiencing a slight decline in the following year (Table 1)

Table 1: Area and Production of Guava in District Hyderabad (2018–2019 to 2022–2023)

Year	Area (ha)	Production (tons)	Yield (tons/ha)
2018–2019	10,518	147,342	14.01
2019–2020	11,026	152,187	13.80
2020–2021	11,309	156,045	13.80
2021–2022	11,535	160,815	13.94
2022–2023	11,034	154,155	13.97

3.1.2 Varieties and Yield Distribution

The Shamlo variety was the most widely grown, accounting for 44.16% of respondents, followed by Ramzani (17.5%), Thadarami (15.0%), Malto (14.16%) and Safadi (12.5%; Table 2). Farmers identified Shamlo as the highest-yielding variety. Regarding yield distribution, 50.83% of farmers harvested between 46 and 55 munds per acre, whereas only 7.5% exceeded 55 munds per acre. For reference, one mund equals 40 kg (Table 3).

Table 2: Guava Varieties Grown in District Hyderabad (n = 120)

Variety	Frequency	Percentage (%)
Shamlo	53	44.16
Ramzani	21	17.50

Variety	Frequency	Percentage (%)
Thadarami	18	15.00
Malto	17	14.16
Safadi	15	12.50
Total	120	100.00

Table 3: Guava Yield per Acre (n = 120) *(1 mund = 40 kg)*

Yield Range (munds/acre)	Frequency	Percentage (%)
25–35	20	16.67
36–45	30	25.00
46–55	61	50.83
>55	9	7.50
Total	120	100.00

3.2 Socioeconomic Characteristics

Most respondents (66.67%) were aged 31–40 years and 45% had completed intermediate or higher education. The majority of farmers (60.83%) were owner-operators, with 54.17% managing ten acres or less. More than half (51.67%) had over ten years of farming experience. Canal irrigation was the primary water source for 54.17% of respondents, while 34.17% relied on tube wells (Table 4).

Table 4: Summary of Socioeconomic Characteristics (n = 120)

Characteristic	Category	Percentage (%)
Age	31–40 years	66.67
Education	Intermediate or higher	45.83
Land Tenure	Owner	60.83

Characteristic	Category	Percentage (%)
Farm Size	≤10 acres	54.17
Experience	>10 years	51.67
Irrigation	Canal	54.17

3.3 Production Economics

The average total cost of guava cultivation was Rs. 223,075 per hectare, including fixed costs (Rs. 88,200), labor (Rs. 46,900), capital inputs (Rs. 53,927) and marketing expenses (Rs. 34,048). Gross income averaged Rs. 376,960 per hectare, resulting in a net income of Rs. 153,885 per hectare (Table 5). The input-output ratio was 1:0.69, corresponding to a revenue-to-cost ratio of 1:1.69.

Table 5: Summary of Production Costs and Returns per Hectare (n = 120)

Item	Amount (Rs./ha)
Fixed Costs	88,200
Labor Costs	46,900
Capital Inputs	53,927
Marketing Costs	34,048
Total Costs	223,075
Gross Income	376,960
Net Income	153,885
Benefit–Cost Ratio (BCR)	1.69

3.4 Marketing Margins

Producers received an average price of Rs. 669 per 40 kg crate, whereas retailers sold the same crate at Rs. 1,447 (Table 6). This distribution indicates that farmers captured only 19% of the consumer rupee, while retailers received 39%, wholesalers 21%, contractors 15% and commission agents 6% (Table 7).

Table 6: Guava Sale Price by Intermediary (Rs./40-kg crate) (n = 120)

Intermediary	Whole Season Average
Producer	669
Contractor	811
Commission Agent	870
Wholesaler	1,072
Retailer	1,447

Table 7: Percentage Share of Consumer's Rupee (n = 120)

Intermediary	Share (%)
Producer	19
Contractor	15
Commission Agent	6
Wholesaler	21
Retailer	39
Total	100



Figure 1: Economic Viability and Market Inefficiencies in the Guava Value Chain from Sindh, Pakistan

4. Discussion

4.1 Production Status and Variety Performance

Guava cultivation in Hyderabad spans 11,034 hectares, producing 154,155 tons annually. The recent decline in both area (4.3%) and production (4.1%) corresponds with findings by Shaikh *et al.* (2020), who attributed yield reductions in Larkana to climate variability and unpredictable rainfall. Heavy reliance on canal irrigation (54.17%) further exposes farmers to water supply fluctuations (Pervaiz *et al.*, 2008).

Shamlo remains the dominant and most productive variety, consistent with Khushk *et al.* (2009), who noted that farmers prioritize high-yielding cultivars. The limited proportion of farmers achieving yields over 55 munds per acre (7.5%) highlights a significant yield gap, suggesting the need for targeted agronomic interventions and extension support.

4.2 Socioeconomic Characteristics and Their Implications

The predominance of middle-aged, smallholder farmers reflects established patterns (Khushk *et al.*, 2009). Small landholdings limit bargaining power, making farmers dependent on intermediaries, as noted by Randhawa *et al.* (2014). The educational profile (45.83% with intermediate or higher education) indicates potential for adopting improved practices and

direct marketing strategies, supporting Khushk *et al.* (2008), who emphasized market system improvements for price stabilization.

4.3 Economic Viability

A net income of Rs. 153,885 per hectare and an input-output ratio of 1:1.69 indicate moderate profitability. These results align with Noonari *et al.* (2016), who reported similar ratios in Larkana. Khushk *et al.* (2008) also recorded a 26% internal rate of return for guava orchards in Sindh, confirming the crop's long-term economic viability.

5. Conclusion

This study provides the first integrated assessment of guava production, yield distribution and marketing margins in District Hyderabad, Sindh. Guava cultivation demonstrates moderate profitability, with a net income of Rs. 153,885 per hectare and an input-output ratio of 1:1.69. However, marketing inefficiencies limit farmer earnings: producers receive only 19% of the consumer rupee.

The dominance of the Shamlo variety (44.16%) and the existing yield gap (only 7.5% of farmers exceed 55 munds per acre) emphasize opportunities for improved agronomic practices and variety selection.

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