

## Colocasia Production and Marketing Channels: Evidence from Punjab

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### Abstract

*The study was undertaken to examine the economic aspects, marketing channels and constraints faced by the Colocasia growers in Punjab during the year 2024-25. Large farmers achieved the highest benefit-cost ratio (1.52) along with the maximum net returns of Rs. 40,963 per acre. Among marketing channels, channel I (Producer-Retailer-Consumer) emerged as the most efficient, with a marketing efficiency of 0.83 and the highest producer share of 45.43 per cent. Farmers faced difficulties in production due to limited availability of important inputs like DAP and urea during sowing, shortage of labour and rising labour costs at the time of harvest. On the marketing front, unfair practices by the intermediaries and inadequate price discovery were the major constraints. To improve farmers' income, interventions such as ensuring timely availability of inputs, strengthening of marketing infrastructure, and providing training on value addition and processing activities are recommended.*

**Keywords:** Colocasia, Marketing efficiency, Price spread, Punjab

**JEL Classification:** Q10, Q12, Q13, Q18.

### Introduction

Agricultural diversification towards horticultural crops, particularly vegetables has gained importance among farmers in Punjab as an alternative to the conventional rice-wheat cropping system. The horticulture sector has emerged as a significant contributor to the state's agricultural economy, contributing around Rs. 26,580 crores to agricultural GDP in 2023-24, which is nearly four times higher than its contribution in 2011-12 (Indian Express, 2025). The area under horticultural crops in Punjab has grown significantly over the last 10-15 years covering about 6.59 per cent of the state's gross cultivated area. It expanded from 323.60 thousand hectares in 2014-15 to 513.19 thousand hectares in 2023-24, while the area under vegetable cultivation increased from 208.03 thousand hectares to 334.47 thousand hectares (Government of India, 2024). This growth indicates a gradual shift of farmers towards horticultural crops as a part of crop diversification. In this light, Colocasia has been selected for the present study to examine its production economics, profitability and role in the agricultural economy.

Colocasia (*Colocasia esculenta* L. Schott), also known as 'Potato of the tropics' or taro, arbi and elephant ear plant, is one of the oldest cultivated tuber crops, with a history of human use spanning about 9,000 years (Rao *et al.*, 2010).

Due to its adaptation and multiple uses, it is widely cultivated in tropical and subtropical regions including India, where it contributes to food security and farmer's livelihoods. According to the All India Coordinated Research Project on Tuber Crops, taro is cultivated on about 40,000 hectares, producing around 0.606 million tonnes annually, with an average productivity of 15.2 tonnes per hectare, which exceeds the global average (Sunitha *et al.*, 2023).

Taro cultivation holds significant economic importance along with their nutritional value. Its profitability was reported in studies conducted in Karnataka and Chhattisgarh with farmers of Mysore district recording higher net returns with benefit-cost ratio of 2.41 (Thamseer *et al.*, 2021). Similarly, front-line demonstrations of Indira Arvi-1 in Chhattisgarh recorded an increase in yield by 29.24 per cent over the traditional practices (Markam *et al.*, 2019). Taro cultivation is profitable, but there are many challenges, especially in production and marketing. The shorter the marketing channels the higher the producer's share, and the more the intermediaries the wider the price spreads and the lower the marketing efficiency (Lakra *et al.*, 2018; Srinivas *et al.*, 2011). Strengthening collective marketing and improving market information systems can help improve producer returns.

The State Horticulture Mission promotes the cultivation of different crops including more vegetables for crop diversification in agriculture. Colocasia is a remunerative

tuber crop with increasing commercial importance in various parts of India, but research has mainly focused on varietal development, production practices, and yield performance. Though economics and marketing of Colocasia have been studied in states like Karnataka and Chhattisgarh (Lakra *et al.*, 2018; Lakra *et al.*, 2019; Thamseer *et al.*, 2021), there is a lack of empirical evidence on production economics, marketing channels, price spread, marketing efficiency and production and marketing constraints of commercially grown Colocasia in Punjab. In addition, no comprehensive study has simultaneously examined both farm-level production economics and the marketing system of Colocasia in the state. The present study attempts to bridge this gap by analyzing the economics of production, marketing efficiency and the constraints faced by farmers in Punjab.

### Data Sources and Methodology

The present study was conducted in Punjab during the agricultural year 2024-25. Since no official statistics on the area under Colocasia cultivation were available from the Department of Horticulture, a preliminary pilot survey was undertaken in consultation with horticulture officials, local extension personnel and progressive farmers to identify the major Colocasia-growing areas in the state. Based on the findings of the pilot survey, Ferozepur district was purposively selected because it had the largest concentration of commercially grown Colocasia in Punjab. A multistage purposive sampling technique was used to select the study sample. In the first stage, Ferozepur district was purposively selected owing to the commercial importance of Colocasia cultivation. In the second stage, four villages, namely Bareke, Machhiwara, Habib Wala, and Nihala Kilcha, were purposively selected for their relatively large area under Colocasia cultivation. In the final stage, 50 Colocasia-growing farmers were selected from these villages through purposive sampling to ensure adequate representation of commercial growers.

The sampled farmers were classified into three farm-size categories based on their operational holdings following the classification commonly adopted by the Government of India, viz., small farmers (1-2 ha), medium farmers (2-4 ha) and large farmers (above 4 ha). The study was primarily based on data collected through a well-structured, pre-tested interview schedule. Personal interviews were conducted with the selected farmers to obtain information on the cost of cultivation, yield, prices received, marketing channels, production economics and constraints associated with Colocasia cultivation. Information on marketing costs and marketing margins was collected through focus group discussions involving 30 market stakeholders, comprising local traders, commission agent-cum-wholesalers and retailers. These discussions were detailed regarding marketing costs, margins of intermediaries, price spreads and movement of produce through the various marketing channels.

### Analytical Tools

The collected data were compiled, tabulated and analyzed using descriptive statistical tools such as averages, percentages and tabular analysis. Production economics was assessed by estimating the cost of cultivation, gross returns, return over variable cost and benefit-cost ratio. Marketing analysis was carried out using the producer's net price, marketing cost, marketing margin, price spread, the producer's share in the consumer's rupee, and marketing efficiency. Marketing efficiency was estimated using Acharya's Modified Measure of Marketing Efficiency (Acharya and Agarwal, 2019).

$$\text{MME} = \frac{\text{FP}}{\text{MC} + \text{MM}}$$

where,

MME = Modified Measure of Marketing Efficiency

FP = Net price received by the producer

MC = Total marketing cost

MM = Total marketing margin

### Results and Discussion

Table 1 shows the cost and return structure of Colocasia cultivation for different farm size categories. The average cost of cultivation was estimated at Rs. 77,774 per acre, with farm-wise costs of Rs. 78,935, Rs. 75,784 and Rs. 78,529 per acre for small, medium and large farms. The major components of production cost were seed, weeding, digging, packing and loading operations. Seed cost accounted for a substantial share of the total cost and was imputed at a uniform rate of Rs. 25,000 per acre across all farm categories, as farmers largely used their own seed.

Similarly, irrigation cost was imputed at Rs. 1,800 per acre. The average expenditure per acre for weeding was Rs. 9,296 to Rs. 9,800, while digging, packing and loading were the most labour-intensive operations, accounting for an average expenditure of Rs. 25,464 per acre. The average price obtained by the farmers was Rs. 1,390 per quintal on large farms and Rs. 1,441 per quintal on small farms. Despite the relatively lower sale price, large farms recorded the highest gross returns (Rs. 1,19,492 per acre) and return over variable cost (Rs. 40,963 per acre), mainly on account of higher productivity and more efficient utilization of resources. Gross returns increased from Rs. 1,04,423 per acre on small farms to Rs. 1,19,492 per acre on large farms showing the advantages of larger scale operations. Large farmers used more fertilizers in comparison with the other two farm categories. The benefit-cost ratio was estimated at 1.32, 1.39, and 1.52 for small, medium, and large farms, respectively, with an overall ratio of 1.52. The benefit-cost ratio was more than unity in all the farm-size categories indicating that Colocasia cultivation was economically viable and profitable. The benefit-cost ratio was relatively higher in

**Table 1: Cost and returns of Colocasia cultivation across different farm categories (Rs./acre)**

| Particulars                             | Small     | Medium    | Large     | Overall   |
|-----------------------------------------|-----------|-----------|-----------|-----------|
| Land preparation                        | 3125.00   | 3133.00   | 3148.15   | 3140.00   |
| Labour cost for land preparation        | 462.50    | 486.67    | 485.20    | 482.00    |
| Sowing                                  | 2000.00   | 2000.00   | 1996.30   | 1998.00   |
| Seed input                              | 25000.00  | 25000.00  | 25000.00  | 25000.00  |
| Weeding                                 | 9500.00   | 9800.00   | 9296.30   | 9480.00   |
| Ridging up                              | 4312.50   | 3913.33   | 1888.90   | 2884.00   |
| Urea                                    | 1147.50   | 1026.00   | 1175.00   | 1125.90   |
| DAP                                     | 2437.50   | 2325.00   | 2677.77   | 2533.50   |
| Sulphur                                 | 393.75    | 376.67    | 564.80    | 481.00    |
| Zinc                                    | 387.50    | 306.67    | 481.50    | 414.00    |
| Iron                                    | 206.25    | 130.00    | 196.30    | 181.63    |
| Labour costs for manure and fertilizers | 556.25    | 466.67    | 550.00    | 526.00    |
| Plant protection                        | 1975.00   | 1600.00   | 1811.11   | 1774.00   |
| Labour cost for plant protection        | 512.50    | 453.33    | 503.70    | 490.00    |
| Irrigation                              | 1800.00   | 1800.00   | 1800.00   | 1800.00   |
| Digging, packing and loading cost       | 25118.75  | 22966.67  | 26953.70  | 25464.00  |
| Total cost                              | 78935.00  | 75784.00  | 78528.73  | 77774.03  |
| Price Realized (Rs./Q)                  | 1440.62   | 1404.16   | 1390.28   | 1402.50   |
| Gross Return (Rs./ Acre)                | 104323.28 | 105350.24 | 119492.00 | 117979.00 |
| Return on Variable cost                 | 25388.28  | 29566.24  | 40963.27  | 40204.97  |
| B:C Ratio                               | 1.32      | 1.39      | 1.52      | 1.52      |

large farms, indicating more efficient use of resources and economies of scale. Mohammad Thamseer *et al.*, (2021) also reported similar findings, identifying Colocasia as a profitable crop diversification option in Karnataka. Similarly, Lakra *et al.*, (2019) observed that yield, gross returns and net income increased with farm size, indicating the economic benefits of larger operational holdings in Colocasia cultivation.

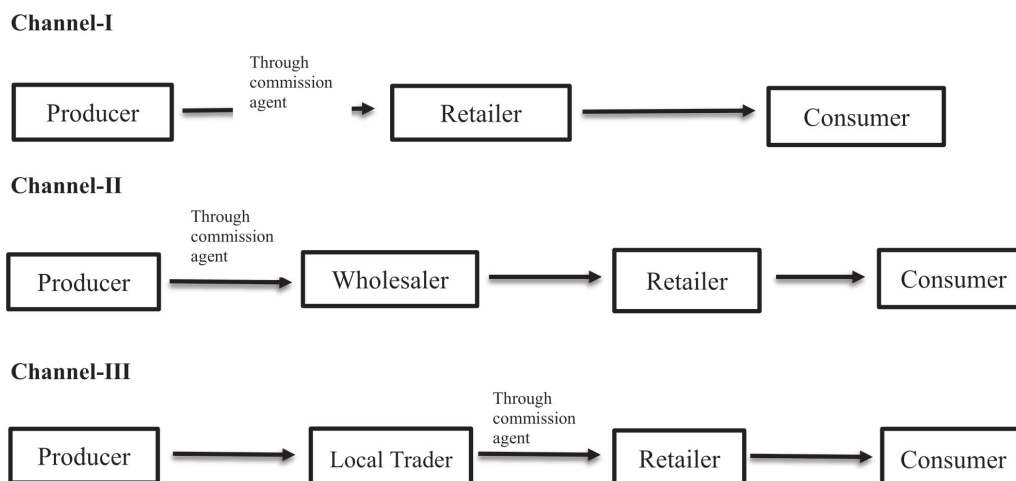
Table 2 shows how Colocasia was marketed through different channels at the farm level. Only large farmers sold directly to retailers through a commission agent; small and medium farmers did not use this channel. 13.59 per cent of the total produce was sold through this channel and farmers reported that it was more time-consuming and complicated than the other two channels. Most of the produce (54.48%)

was sold to local traders, as their outlets were located close to the farms and were convenient for farmers. About 31.93 per cent of the produce was sold through wholesalers, mainly because farmers had long-standing relationships with these agents.

The comparative analysis of different marketing channels in Table 3 revealed considerable variation in marketing costs, margins and producer's share in the consumer's rupee. Among the three channels, Channel I (Producer-Retailer-Consumer) emerged as the most efficient, with a marketing efficiency of 0.83 and the highest producer share of 45.43 per cent. The higher producer's share in this channel was mainly due to the absence of additional intermediaries, which reduced marketing costs and price

**Table 2: Channel-wise disposal of Colocasia at farm level (Per cent)**

| Particulars  | Small  | Medium | Large  | Overall |
|--------------|--------|--------|--------|---------|
| Retailer     | -      | -      | 14.93  | 13.59   |
| Wholesaler   | 41.64  | 2.57   | 34.13  | 31.93   |
| Local trader | 58.36  | 97.43  | 50.94  | 54.48   |
| Total        | 100.00 | 100.00 | 100.00 | 100.00  |



**Figure 1: Representation of marketing channels of Colocasia**

spread. The total marketing cost and price spread in this channel were estimated at Rs. 657.00 and Rs. 1,637.00 per quintal, respectively. In Channel II (Producer-Wholesaler-Retailer-Consumer), the producer's share declined to 42.11 per cent, while the price spread increased to Rs. 1,736.80 per quintal. Wholesalers' participation increased marketing costs and intermediary margins, thereby lowering the consumer expenditure accruing to the producer. Consequently, this channel recorded the lowest marketing efficiency (0.73) among all the channels studied. Channel III (Producer-Trader-Retailer-Consumer) accounted for the largest share of produce marketed by the sample farmers. This channel had a higher share of the producer (43.31%) than Channel II, but it had the highest marketing cost (Rs. 762.32 per quintal) due to additional expenses incurred by local traders and retailers. The marketing efficiency of this channel was estimated at 0.76, which is between Channel I and Channel II. Overall, the results revealed that marketing channels with fewer intermediaries allocated a higher share of the consumer's rupee to producers and improved marketing efficiency. The findings further suggested that the involvement of intermediaries should be reduced and direct marketing arrangements should be encouraged to increase producers' returns and improve the overall efficiency of the marketing system. The present findings are consistent with the findings of Srinivas *et al.*, (2011), who also reported that shorter marketing channels in Colocasia improve the producer's share and marketing efficiency by reducing the intermediaries.

The findings show that marketing channels with fewer intermediaries are more efficient and allocate a larger share of consumer expenditure to producers. Similar findings were reported by Lakra *et al.*, (2018), who found that the producer's share in the consumer's rupee was higher in shorter marketing channels for Colocasia in Chhattisgarh. The study further revealed that the presence of additional

intermediaries increased the price spread and decreased the producer's share.

#### **Problems faced by farm households in the production and marketing of Colocasia in Punjab**

A close examination of the production and marketing challenges in the study area (Table 4) revealed that farming households faced major input shortages. Most respondents reported being unable to obtain sufficient DAP and urea during the main growing season. They also reported that the scarcity of labour during the peak production period drove up wages and increased production costs. All respondents believed that the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) disrupted the labour market in Punjab. MGNREGA adversely affected vegetable growers by increasing competition for workers during the busiest season. More than half of the respondents reported that inputs were overpriced, and three out of four stated that local dealers pressured them to buy extra items labelled as fortified or beneficial, which further increased production costs. The presence of these issues indicated that exploitative practices were widespread among Colocasia growers in Punjab. Only a few households reported problems with the quality of input, indicating that most farmers are getting good quality inputs for their fields. The quality problems were few and localized, thus not a major concern. The present findings are in line with Kumar *et al.*, (2024), who indicated high input costs, non-availability of critical resources and labour-related problems as major constraints affecting vegetable cultivation in India.

The research area was rural Punjab, on the border with India, which faces many institutional problems, as shown in Table 5. The surveyed farmers unanimously identified poor rural road infrastructure as a major constraint in the marketing of Colocasia. They also reported that marketing malpractices posed additional challenges in the successful

**Table 3: Comparative analysis of marketing costs, margins and price spread in different marketing channels of Colocasia (Rs./qtl.)**

| Particulars                                           | Channel I        | Channel II         | Channel III        |
|-------------------------------------------------------|------------------|--------------------|--------------------|
| <b>A. Producer</b>                                    |                  |                    |                    |
| Sale price received by producer                       | 1542<br>(51.44)  | 1423<br>(47.43)    | 1384<br>(46.13)    |
| Marketing cost incurred by producer                   | 179<br>(5.95)    | 159.80<br>(5.33)   | 84.68<br>(2.82)    |
| Net price received by producer                        | 1363<br>(45.43)  | 1263.20<br>(42.11) | 1299.32<br>(43.31) |
| <b>B. Local Trader</b>                                |                  |                    |                    |
| Marketing cost incurred by trader                     | —                | —                  | 253.84<br>(8.46)   |
| Trader's margin                                       | —                | —                  | 512.16<br>(17.07)  |
| Sale price of trader / Purchase price of retailer     | —                | —                  | 2150<br>(71.67)    |
| <b>C. Wholesaler</b>                                  |                  |                    |                    |
| Marketing cost incurred by wholesaler                 | —                | 135.19<br>(4.51)   | —                  |
| Wholesaler's margin                                   | —                | 391.80<br>(13.06)  | —                  |
| Sale price of wholesaler / Purchase price of retailer | —                | 1950<br>(65.00)    | —                  |
| <b>D. Retailer</b>                                    |                  |                    |                    |
| Marketing cost incurred by retailer                   | 478<br>(15.94)   | 312.50<br>(10.42)  | 423.80<br>(14.13)  |
| Retailer's margin                                     | 980<br>(32.67)   | 737.50<br>(24.58)  | 426.20<br>(14.21)  |
| Consumer purchase price                               | 3000<br>(100.00) | 3000<br>(100.00)   | 3000<br>(100.00)   |
| <b>E. Summary Indicators</b>                          |                  |                    |                    |
| Total marketing cost                                  | 657<br>(21.90)   | 607.50<br>(20.25)  | 762.32<br>(25.41)  |
| Total marketing margin                                | 980<br>(32.67)   | 1129.30<br>(37.63) | 938.36<br>(31.28)  |
| Price spread                                          | 1637<br>(54.57)  | 1736.80<br>(57.89) | 1700.68<br>(56.69) |
| Producer's share in consumer's rupee (%)              | 45.43            | 42.11              | 43.31              |
| Marketing efficiency                                  | 0.83             | 0.73               | 0.76               |
| Rank                                                  | I                | III                | II                 |

**Table 4: Production-related constraints faced by the Colocasia growers.**

| Sr. No. | Problems/Issues Faced by Farmers              | Proportion of Farmers (%) |
|---------|-----------------------------------------------|---------------------------|
| 1       | Hike in labour price in peak season           | 80.00                     |
| 2       | MGNREGA not good for vegetable growers        | 100.00                    |
| 3       | Inputs of inferior quality                    | 4.00                      |
| 4       | Unnecessary items sold with inputs            | 76.00                     |
| 5       | Overpriced inputs                             | 54.00                     |
| 6       | Shortage of inputs in peak sowing season      | 82.00                     |
| 7       | Aware of Govt. subsidy schemes for vegetables | 6.00                      |
| 8       | Delays sowing of paddy in next season         | 6.00                      |

marketing of the product. Nearly 86 per cent of Colocasia growers reported inadequate price realization from the sale of mature crop. Only one producer was aware of the e-NAM portal (established to remove middlemen and improve price realization for farmers), indicating a serious awareness problem in rural Punjab. Production and marketing constraints caused by infrastructural bottlenecks reduced Colocasia growers' bargaining power and their economic welfare. Similar marketing-related challenges have been reported by Kumar *et al.*, (2024), who found that inadequate marketing facilities, poor market accessibility and low prices received by vegetable growers were major constraints for profitable vegetable farming. Similar constraints in production and marketing of vegetables were reported by Choudhary *et al.*, (2022) in Rajasthan.

**Table 5: Marketing constraints faced by the Colocasia growers.**

| Sr. No. | Marketing Problems Faced by Farmers | Proportion of Farmers (%) |
|---------|-------------------------------------|---------------------------|
| 1       | Not aware of e-NAM                  | 98.00                     |
| 2       | Marketing malpractices              | 100.00                    |
| 3       | Poor quality of roads               | 100.00                    |
| 4       | Do not receive adequate price       | 86.00                     |

### Conclusions and Policy Implications

Colocasia cultivation in Punjab is commercially concentrated in Ferozepur district and is a profitable crop, particularly for large farmers due to economies of scale. Local traders were the dominant marketing channel, while direct sale to retailers provided better price realization and higher marketing efficiency. However, farmers faced major constraints, including inadequate input availability, rising input costs, labour shortages, and market related constraints. To improve the profitability of Colocasia cultivation, timely availability of fertilizers at government and cooperative outlets during the vegetable-growing season would help reduce uncertainty and input-related distress. Promotion of mechanization for labour intensive operations like digging

and harvesting along with better extension support for market information and price discovery, can enhance the capacity of farmers to make better marketing decisions. Formation of Farmer Producer Organizations (FPOs) and encouraging direct marketing channels could further strengthen the bargaining power of Colocasia growers, reduce dependence on intermediaries and improve the producer's share in the consumer's rupee.

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