



## Constraints encountered in production, marketing and value addition of Acid Lime in North Karnataka

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### Abstract

Acid lime (*Citrus aurantifolia* Swingle) is one of the important citrus crops cultivated widely in North Karnataka due to its year-round bearing habit, nutritional importance and extensive utilization in household consumption, food processing and pharmaceutical industries. The present study was undertaken to analyse the major constraints faced in the production, marketing and value addition of acid lime in North Karnataka. Primary data were collected from 90 respondents comprising 60 acid lime growers, 15 value addition units and 15 market intermediaries through multistage random sampling and snowball sampling techniques during the agricultural year 2024-25. Garrett's ranking technique was employed to identify and rank the constraints faced by the respondents. The study revealed that seasonal scarcity of water (54.72) was the major production constraint followed by labour shortage (51.63) and inadequate and timely credit availability (50.60). In marketing, fluctuations in prices (65.15), exploitation by middlemen (52.95) and high transportation cost (50.00) emerged as the major constraints affecting farmers' profitability. Further, value creators reported high wages of labour (68.07), fluctuations in prices of raw materials (60.47) and lack of technical knowledge and skilled labour (57.93) as the major constraints in value addition activities. The study highlighted the need for improved irrigation facilities, institutional credit support, market infrastructure, storage facilities, technical training and efficient marketing systems to enhance the profitability and sustainability of acid lime cultivation and value addition activities in North Karnataka.

**Keywords:** Acid lime, constraints, garrett ranking, marketing, value addition

### Introduction

Horticulture received a limited attention in India, with national priorities from 1948 to 1980 largely focused on cereal production to ensure food security. The turning point came with the establishment of the National Horticulture Board (NHB) in 1984, recognizing the sector's potential. A major boost followed with the launch of the National Horticulture Mission (NHM) in 2005-06 under the 10<sup>th</sup> Five-Year Plan, aimed at promoting holistic and region-specific growth of horticulture. These initiatives, along with increased investment, adoption of improved technologies and knowledge-based practices, have transformed horticulture into a key contributor to agricultural growth, rural development and income diversification in India.

Acid lime (*Citrus aurantifolia* Swingle) is one of the important citrus fruits cultivated widely across India because of its extensive use in household cooking, pharmaceutical preparations and food processing industries. The plant is a small, thorny and evergreen tree with highly aromatic leaves, flowers and fruits. Acid lime fruits are generally small, round to oval in shape with thin greenish-yellow rind and juicy acidic pulp. Based on taste characteristics, limes are mainly categorized into sweet lime and acid lime, among which acid lime is more popular due to its medicinal and nutritional significance. One of the major advantages of acid lime cultivation is its capacity to flower and produce fruits throughout the year, ensuring continuous availability for fresh consumption as well as processing purposes. The fruits are commonly harvested at the green stage for their strong acidic flavor, while fully yellow fruits possess a comparatively mild taste. Acid lime grows well under warm climatic conditions with sufficient

sunlight and well-drained soils. Being a rich source of vitamin C, antioxidants and essential minerals, the fruit plays an important role in enhancing nutrition and is widely utilized in beverages, pickles, culinary products and traditional health remedies (Subha, 2013) [11].

The crop is predominantly grown by small and marginal farmers, playing a vital role in enhancing their income and supporting various agro-processing industries across the state. It has been officially chosen as the "One District One Product" (ODOP) for Vijayapura under the Pradhan Mantri Formalisation of Micro food processing Enterprises (PMFME) scheme, aiming to boost local agro-processing and farmer incomes by promoting this unique and significant crop from the district.

Despite the economic and nutritional importance of Acid lime cultivation, farmers and market participants encounter several challenges across production, value addition and marketing activities. In the production stage, issues such as pest and disease infestation, increasing input costs, labour scarcity, water shortages and climatic uncertainties adversely affect productivity and profitability. Further, the development of value-added products is limited due to inadequate processing facilities, lack of technical expertise, poor storage infrastructure and high investment requirements. Marketing of acid lime is also associated with numerous constraints including unstable market prices, dominance of intermediaries, high transportation expenses, absence of organized markets and inadequate access to timely market information. These challenges collectively hinder efficient production, processing and marketing of acid lime and reduce the income potential of growers and processors.

**Materials and Methods**

A multistage random sampling technique was adopted for the study. Vijayapura and Kalaburagi districts were purposively selected based on the highest area under Acid lime cultivation. In the second stage, two taluks from each district were selected and fifteen acid lime growers were randomly chosen from each taluk, thereby constituting a total sample of 60 farmers to analyse the constraints faced in acid lime production.

Further, 15 value addition units were selected using snowball sampling technique to identify the constraints encountered in processing and value addition activities. To study the marketing constraints, 15 market intermediaries comprising commission agents, wholesalers and retailers were selected from major markets of the study area. Thus, a total of 90 respondents including acid lime growers, value addition units and market intermediaries were selected for the detailed investigation of production, value addition and marketing constraints in acid lime cultivation.

The data pertained to the agricultural year 2024-25. The primary data was collected with the help of a well-designed, pre-tested and comprehensive schedule exclusively prepared for the purpose. The schedule was prepared after discussing with various specialists.

**Tabular presentation**

The data collected were presented in tabular form to facilitate easy comparison. The general characteristics of sample farmers, cost and returns of acid lime orchard were collected from sample respondents and presented in tabular form.

**Garrett’s ranking technique**

The constraints faced by the sample farmers during groundnut production and during value creation were ranked by using Garrett’s ranking technique. As per this method, respondents were asked constraints that they faced in production and value creation. Depending upon extent of constraints faced by them rankings was assigned separately to each constraint by the respondents. Likewise, ranks were

assigned to different frequency of various factors/parameters. The results of such rankings were converted into score value by using the following formula.

$$\text{Percent position} = \frac{100 * (R_{ij} - 0.5)}{N_j}$$

Where,

R<sub>ij</sub> = Rank given for the i<sup>th</sup> factor by j<sup>th</sup> respondent.

N<sub>j</sub> = Number of factors ranked by the j<sup>th</sup> respondent.

By referring the Garrett’s table, per cent position estimated was converted into score. Then, for each factor the scores of various respondents were added and the mean score was calculated. The factor with the highest mean score was considered to be the most constraint. Thus, mean score for each constraint was ranked by arranging them in the descending order.

**Result and Discussion**

This chapter presented the major findings of the study, arranged under specific subheadings in line with its objectives. The necessary information was collected from primary sources and analyzed using appropriate analytical methods to accomplish the set objectives of the research.

**General characteristics of acid lime farmers**

The general characteristics of sample respondents were studied to understand their background in the study area. Table 1 represents the socio-economic characteristics of acid lime farmers in terms of age, family composition and educational status and farming experience in the study area.

The results showed that the most of the acid lime farmers were in the age group of 36-50 years (48.34 %), followed by 25-35 years (33.33 %) and above 50 years (18.33 %). The average age of the respondents was 41 years, which showed that most of the acid lime growers belonged to the middle age group and in their economically active years.

**Table 1:** General characteristics of acid lime farmers in the study area (n=60)

Sl. No.	Particulars	No. of farmers	%
I.	Age group (No.)		
a.	Between (25-35 years)	20	33.33
b.	Between (36-50 years)	29	48.34
c.	> 50 years	11	18.33
	Average age (years)	41	
II.	Type of family		
a.	Joint	22	36.67
b.	Nuclear	38	63.33
III.	Size of the family		
a.	Small (<4 members)	05	08.33
b.	Medium (4-6 members)	42	70.00
c.	Large (>6 members)	13	21.67
	Average members	05	
IV.	Educational status		
a.	Illiterate	07	11.67
b.	Primary	14	23.33
c.	High School	23	38.33
d.	PUC	10	16.67
e.	Degree and above	06	10.00
V.	Farming experience		
a.	Low (< 10 years)	09	15.00
b.	Medium (Between 10-20 years)	38	63.33
c.	High (> 20 years)	13	21.67
	Average experience (years)	16.38	

With respect to family type, 63.33 per cent of the farmers belonged to nuclear families, while 36.67 per cent were from joint families. A nuclear family typically consists of a husband, wife and their dependent children living together as a single household unit. This shows that nuclear families were more common among acid lime growers in the study area.

The analysis of family size revealed that the most of the respondents (70.00 %) had medium-sized families (4-6 members), followed by large families comprises more than six members (21.67 %), while only 8.33 per cent of the respondents had small families (less than four members). The average size of the family was five members per household.

Education status of farmers indicated that 38.33 per cent had completed the high school, 23.33 per cent had primary education, 16.67 per cent completed PUC and 10.00 per cent had degree and above. A small proportion (11.67 %) of the farmers were illiterate. These results showed that most of the farmers had access to at least basic schooling, though higher education levels were relatively limited.

With respect to farming experience, majority of the farmers were having 10-20 years of experience (63.33 %), followed by high level experience with more than 20 years (21.67 %) and low-level experience with less than 10 years (15.00 %)

of farming experience, with an average farming experience of 16.38 years.

The general characteristics of the respondent farmers revealed that majority of the acid lime growers were in the age group of 36-50 years. Most of the sample respondents had nuclear type of family. The average family size of respondent farmers was medium sized with 4-6 members, with high school education (38.33 %). Further, majority of the farmers were having 10-20 years of farming experience. The report of the study area indicated that, most of the farmers were educated up to basic schooling but lacked higher education and awareness about improved technologies for their agricultural and horticultural production. These results are similar with the study conducted by Chikkalaki and Krishnamurthy (2023) [4] on fruit crop growers of Vijayapura district, India.

### Constraints faced by farmers in production and marketing of acid lime

Table 2 presented the major constraints faced by farmers in production of acid lime. The foremost production constraint identified was the seasonal scarcity of water, with a Garrett score of 54.72, ranked first. This indicates that insufficient water availability critically affects crop growth, particularly during dry periods, reducing both yield and quality. These outcomes correspond with Bhat *et al.* (2015) [2].

**Table 2:** Constraints faced by farmers in production of acid lime

Sl. No.	Constraints	Garrett's mean score	Rank
1	Seasonal scarcity of water	54.72	I
2	Labour shortage	51.63	II
3	Inadequate and timely credit	50.60	III
4	Pest and disease infestation	49.57	IV
5	High intensity of weed infestation	48.78	V
6	Irregular and poor electricity supply	43.32	VI

The second-ranked constraint was labour shortage, with a Garrett score of 51.63. Labour scarcity particularly impacts labour-intensive activities such as pruning, harvesting and inter-cultural operations, causing delays and inefficiencies in farm management. Similar findings were reported by More *et al.* (2008) [7].

Inadequate and untimely access to credit (Garrett score of 50.60) was the third major constraint. Limited financial resources restrict farmers' ability to purchase essential inputs such as fertilizers, pesticides and quality planting material, thereby constraining optimal production.

Pest and disease infestation (Garrett score of 49.57) was ranked fourth, reflecting farmers' concerns regarding crop losses due to inadequate pest management measures. High intensity of weed infestation, with a Garrett score of 48.78,

ranked fifth. Weeds compete with lime trees for nutrients, water and light, negatively impacting growth and yield.

Irregular and poor electricity supply was the sixth-ranked production constraint (Garrett score of 43.32). Frequent power outages effect water pumping for irrigation and other farm operations, leading to reduced productivity.

### Constraints faced by farmers in marketing of acid lime

Table 3 presented the major constraints faced by farmers and market intermediaries in the marketing of acid lime. Fluctuations in prices were recorded as the foremost constraint, with a Garrett score of 65.15. Price instability makes it difficult for farmers to plan their sales and estimate their income, thereby creating financial uncertainty.

**Table 3:** Constraints faced by farmers in marketing of acid lime

Sl. No.	Constraints	Garrett's mean score	Rank
1	Fluctuations in prices	65.15	I
2	Exploitation by middlemen	52.95	II
3	High cost of transportation	50.00	III
4	Lack of storage facility	49.65	IV
5	Lack of market information	47.68	V
6	Difficulty in accessing distant markets	33.56	VI

Exploitation by middlemen was ranked second (Garrett score of 52.95). Due to limited bargaining power and inadequate market information, farmers often receive lower prices for their produce, which reduces their profit margins.

High cost of transportation (Garrett score of 50.00) was the third major constraint, particularly affecting farmers in remote locations, reducing net returns. Lack of storage facilities (Garrett score of 49.65) was ranked fourth, forcing

the farmers to sell their produce immediately after the harvest, often at lower prices. These results correspond with Yarazari *et al.* (2022)<sup>[13]</sup>.

Lack of market information (Garrett score of 47.68) was the fifth-ranked constraint, as farmers often do not have timely information about prices, demand trends and potential buyers. Difficulty in accessing distant markets, with a Garrett score of 33.56, was the sixth-ranked constraint, limiting opportunities for wider market reach and better price realization. Similar results were reported by Chikkalaki and Krishnamurthy (2023)<sup>[4]</sup>.

### Constraints faced by value creators in value addition of lime

Table 4 presented the major constraints encountered by value creators during the processing and marketing of acid lime products. The most prominent constraint identified was high wages of labour, with a Garrett mean score of 68.07. Higher labour costs increase the overall production expenses, making it difficult for processors to maintain competitive pricing and profitability. Similar findings are consistent with Jaikumar (2009)<sup>[6]</sup>.

**Table 4:** Constraints faced by value creators in value addition of acid lime

Sl. No.	Constraints	Garrett's mean score	Rank
1	High wages of labour	68.07	I
2	Fluctuations in prices of raw materials	60.47	II
3	Lack of technical knowledge and skilled labour	57.93	III
4	Losses during storage	53.40	IV
5	Poor transportation and connectivity issues	45.27	V
6	Limited availability of raw materials during off season	32.60	VI
7	Poor electric supply	30.27	VII

Fluctuations in the prices of raw materials (Garrett score of 60.47) was the second major constraint. Variability in raw material costs complicates procurement planning and financial management, impacting the smooth functioning of processing operations. The shortage of technical knowledge and skilled labour (Garrett score of 57.93) was ranked third. A lack of trained personnel can lead to inefficiencies, production delays and compromises in product quality, which affect the marketability of value-added lime products. These findings are similar with Upadhyay *et al.* (2018)<sup>[12]</sup>.

Losses during storage, with a Garrett score of 53.40, were identified as another significant issue. Inadequate storage facilities or improper handling practices result in spoilage and quality deterioration, reducing overall production efficiency.

Poor transportation and connectivity issues (Garrett score of 45.27) were ranked fifth, as they increase the difficulty and cost of moving raw materials and finished products between farms, processing units and markets. Limited availability of raw materials during the off-season (Garrett score of 32.60) was the sixth-ranked constraint, reflecting seasonal supply challenges that affect continuous processing. Finally, irregular electricity supply (Garrett score of 30.27) was reported as a seventh constraint. Frequent power outages or voltage fluctuations disrupt production processes, leading to operational delays and increased costs. These results are in line with Anjana (2018)<sup>[11]</sup>.



**Fig 2:** Data were collected from market intermediaries to identify the marketing constraints



**Fig 1:** Data were collected from farmers to identify the production constraints

### Conclusion

The study revealed that Acid lime cultivation and its value addition activities played an important role in improving the income and livelihood opportunities of farmers in the study area. However, the sector was affected by several production, value addition and marketing constraints which limited its overall profitability and growth potential. Among the production constraints, seasonal scarcity of water, labour shortage and inadequate access to credit were the major problems faced by farmers. In marketing, price fluctuations, exploitation by middlemen and high transportation costs emerged as the most serious challenges affecting farmers' returns. Further, value creators encountered difficulties such as high labour wages, fluctuations in raw material prices and lack of technical knowledge and skilled labour during processing and marketing of value-added products. The study therefore highlighted the need for improved irrigation facilities, timely institutional credit, effective pest management practices, better storage and transportation infrastructure, market intelligence services and skill-oriented training programmes for processors and farmers. Strengthening processing facilities and organized marketing systems was found essential for enhancing the efficiency, profitability and sustainability of acid lime production and value addition in North Karnataka.

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