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Production Regions, Markets and Constraints Regarding Acid Lime Production in India : A Study

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ABSTRACT

The data for present study was collected from states of Andhra Pradesh, Maharashtra, Gujarat, Karnataka, Odisha and Tamil Nadu to study production and market regions and for studying constraints, ten respondents were chosen randomly from six villages of Vijayapura district based on their proximity to APMC (Agricultural Produce Market Committee) markets and urban centers, facilitating easier access to transportation and market infrastructure. This strategic selection ensures representation from areas with better logistical support for acid lime, reflecting differences in access to market resources compared to more remote villages. Thus, the sample size comprises of 60 farmers. Andhra Pradesh led acid lime production (630.28 mt), followed by Gujarat (533.28 mt) and Karnataka (309.65 mt), while Maharashtra, Madhya Pradesh, Telangana and Tamil Nadu also contributed significantly. Major acid lime markets were located in Andhra Pradesh (Anantapur, Kurnool, Kadapa, Prakasam and Nellore), Maharashtra (Jalgaon, Ahmednagar, Aurangabad and Nasik), Tamil Nadu (Dindigul, Coimbatore and Tirunelveli), Gujarat (Kheda, Anand and Vadodara), Karnataka (Dharwad, Belagavi and Vijayapura) and Odisha (Cuttack and Puri), benefiting from fertile soil and strong distribution networks. Major production constraints included water shortages during peak seasons (highest concern with a mean Garrett's score of 73.78), high wage rates (71.82) and irregular electricity supply (61.32). Other challenges included labour shortages, changing rainfall patterns and high costs for inputs like pesticides and fertilizers. In marketing, price fluctuations is the major constraints with a mean Garrett's score of (66.28), transportation issues with (64.91) and lack of market information (62.8) were top concerns, along with high marketing costs and difficulty meeting quality standards. Financial constraints included inadequate access to institutional loans with a mean Garrett's score of (71.42), limited facilities from horticulture departments (61.16) and lack of personal funds (47), along with delayed loan approvals and a lack of grassroots-level support networks.

Keywords : Market, Constraints, Garrett's ranking, Acid lime, Production

ACID LIME (*Citrus aurantifolia* Swingle) commonly known as 'Kagzi Nimbu' in India, is a small citrus fruit known for its tart flavor and high vitamin C content which helps improve immunity, combat scurvy and promote healthy skin. Acid lime typically consists of around 88 per cent water, 0.3 per cent protein, 0.2 per cent fat, 1 per cent fiber, 10 per cent carbohydrates and 0.5 per cent ash. The fruit is a rich source of essential minerals like potassium, calcium and phosphorus. The fruit is also used in traditional medicine to treat various ailments, including sore throat, dehydration and indigestion. Additionally, lime peels are rich in essential oils, which are utilized in the cosmetic and perfume industries. Acid lime annual global production is estimated at around 10 million tons, with primary production regions in Asia, the Americas, the Middle East and parts of Africa. In 2022 India is a leading global producer contributing over 3.8 mt annually, primarily to meet domestic demand with limited exports (Anonymous, 2023c). Mexico

follows as a top producer and exporter, producing around 3 mt yr^{-1}, with the United States as its largest export market. Karnataka also plays a key role contributing about 10.13 per cent to the national production of acid limes.

In recent years, India has become one of the top global producers of acid lime, driven by increased demand in international markets and government initiatives promoting horticultural development. Globally, Indian limes and lime-based products are exported to countries in the Middle East, Europe and Southeast Asia. The export market is expanding, fueled by India's competitive pricing and the high quality of its produce. Additionally, the lime industry provides a livelihood to millions of small and marginal farmers with ancillary industries like processing, packaging and transportation creating further economic opportunities. However, despite these opportunities, the industry faces challenges in standardizing quality and meeting global phytosanitary requirements, which limit the full exploitation of export potential. While acid lime cultivation offers immense potential, it is constrained by several challenges. Climatic conditions, including irregular rainfall and extreme temperatures, significantly affect yields. Pests and diseases, such as citrus canker and leaf miner infestations, further exacerbate the problem, leading to crop losses. In addition, post-harvest losses due to poor infrastructure for storage and transportation is a persistent issue. Fragmented landholdings and lack of access to high-quality planting material, along with inadequate knowledge of modern cultivation techniques, hinder productivity. The export potential of Indian acid limes represents a significant area of opportunity and growth for India's agribusiness sector.

METHODOLOGY

The data for present study was collected from the state Karnataka to study production, market regions and constraints. Ten respondents were chosen randomly from each six villages of Vijayapura district based on their proximity to APMC (Agricultural Produce Market Committee) markets and urban centres, facilitating easier access to transportation and market infrastructure. This strategic selection ensures representation from areas with better logistical support for acid lime, reflecting differences in access to market resources compared to more remote villages. Thus, the sample size comprise of 60 farmers.

Analytical Tools and Techniques

Descriptive Statistics : Descriptive statistics is a summary statistic that quantitatively describes or summarizes data of a collection of variables. They provide simple summaries about the sample and the measures like averages and percentages were used in the study.

Garrett's Ranking Technique : Garrett's ranking technique was used to rank the preferences indicated by the respondents on different factors. As per this method, respondents have been asked to assign the rank for all factors and the outcomes of such ranking have been converted into score value with the help of the following formula :

$$\text{Percentage position} = \frac{100\,(Rij - 0.5)}{Nj} \quad \text{.....(xvii)}$$

Where,

R_{ij} = Rank given for the i^{th} variable by j^{th} individual

N_j = Number of variables ranked by j^{th} individual

The percentage position is converted into scores by referring to the Garrett's score table. Then, for each factor, the scores of the individual respondents were added together and divided by the total number of respondents for whom the scores were added. These mean scores for all the factors were arranged in descending order and the most preferred factors were identified through the ranks.

RESULTS AND DISCUSSION

Socio-Economic Profile of Acid Lime Growers

Age : About 63.33 per cent respondents belonged to middle age group, 33.33 per cent belonged to young age group and 3.34 per cent belonged to old age group of the sample farmers.

The above result reflects the physical demands of farming and generational shifts. Middle-aged farmers are often the most experienced, balancing both energy and expertise. This distribution highlights the middle-aged groups pivotal role in sustaining agricultural practices. The above results are similar to study conducted by Passah and Tripathi (2018).

Education : The data furnished in Table 1 shows that, 23.33 per cent had completed primary school followed by 21.67 per cent had completed middle school, two categories (illiterates and higher school) belonged to 20 per cent and 15.00 per cent had completed PUC.

The above result pattern suggests limited access to higher education among farmers with most of them attaining basic education but fewer progressing to advanced levels, reflecting socio-economic or regional educational barriers. The above results are similar to study conducted by Jadhav and Manjunath (2011).

TABLE 1

Socio-economic profile of acid lime growers

(n = 60)

Particulars	Number	Per cent
Age (years)		
Young age (18-35)	20	33.33
Middle age (36-59)	38	63.33
Old age (>60)	2	3.34
Education		
No formal education	12	20.00
Primary school (up to 4th)	14	23.33
Middle school (5th to 7th)	13	21.67
Higher school (8th to 10th)	12	20.00
PUC and above	9	15.00
Family size		
Small (up to 5 members)	25	41.67
Medium (6 to 10 members)	27	45.00
Big (>10 members)	8	13.33
Size of land holding		
Marginal farmers (up to 2.5 ac)	16	26.67
Small farmers (2.5 to 5 ac)	16	26.67
Semi-medium farmers (5 to 10 ac)	16	26.67
Medium farmers (10 to 25 ac)	8	13.32
Large (Above 25 ac)	4	6.67

Source : Data collected from primary survey

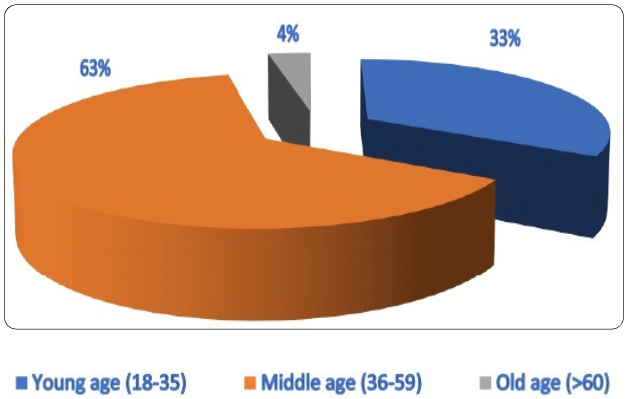

Fig. 1 : Age of the respondents

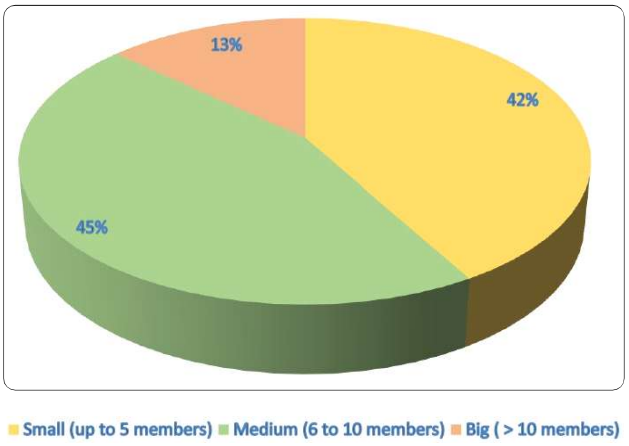

Fig. 2 : Family size of respondents

Family Size : About 45.00 per cent of the sample farmer households had medium family size followed by small family size (41.67%) and big family size (13.33%).

Medium-sized families are optimal for farming in balancing labour needs and financial stability. Small families could indicate younger farmers or those using more mechanized farming techniques, reducing the need for large household labour. Larger families may be less common due to the increasing costs of living and education, which make large family sizes less sustainable for farming households. Additionally, rural-urban migration trends might reduce family sizes, especially in farming communities. The above

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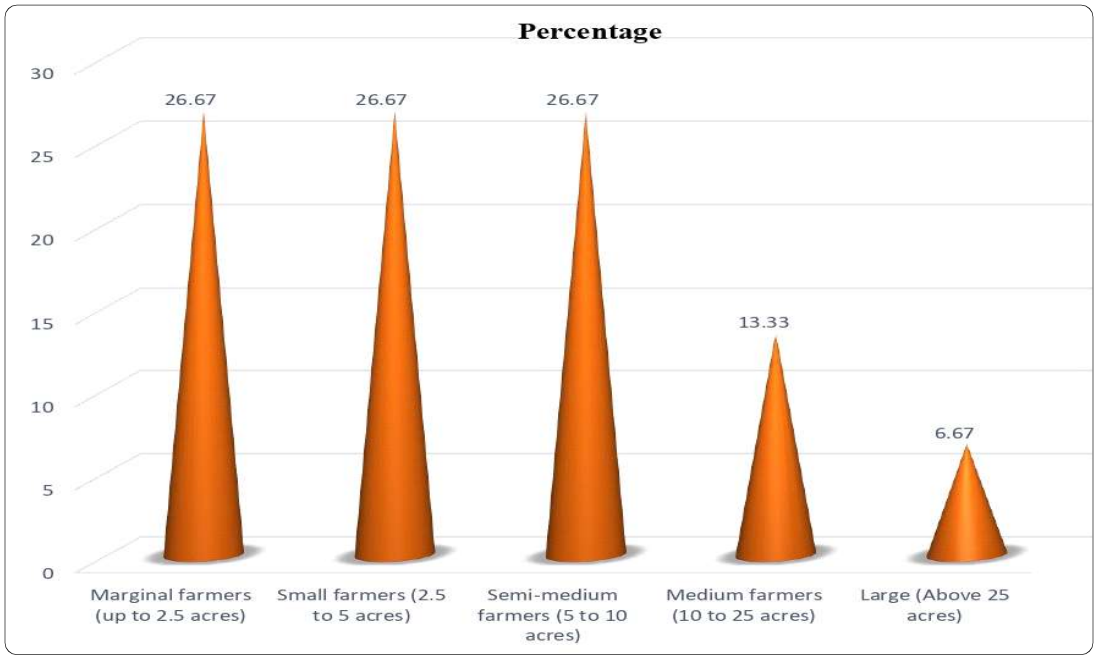

Fig. 3 : Land holding of the respondents

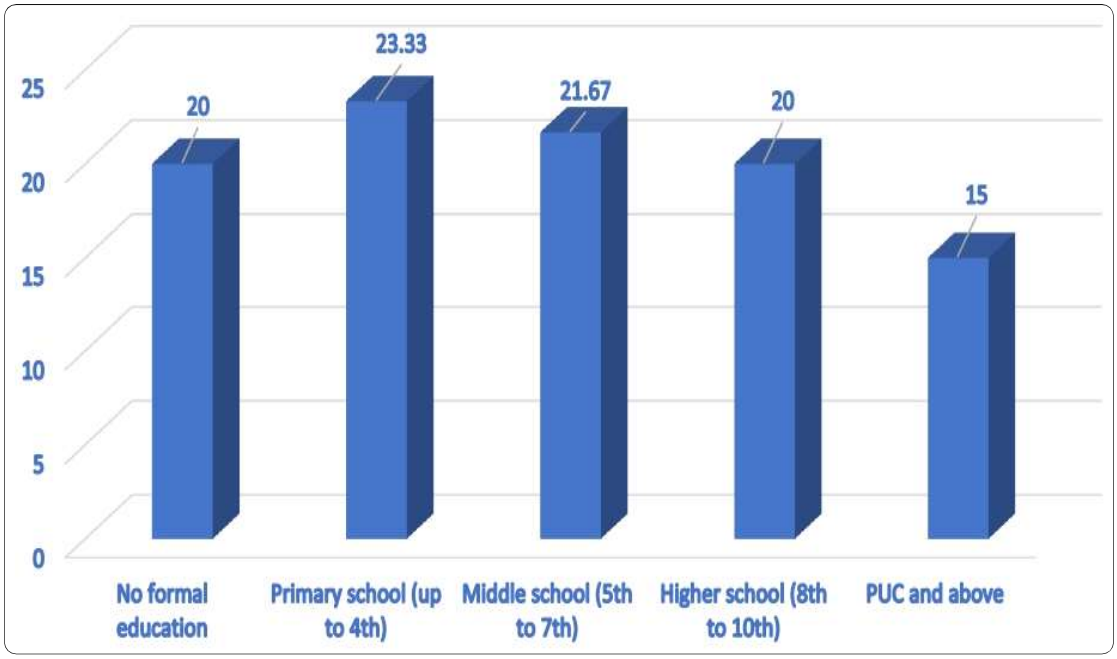

Fig. 4 : Education of the respondents

results are similar to study conducted by Ramukumar (2015).

Size of Land Holding : The three categories of farmers *viz.,* marginal farmers, small farmers and semi medium farmers collectively constitute about 80.01 per cent, however medium farmers and large farmers were to an extent of 13.32 per cent and 6.67 per cent, respectively.

Marginal and small farmers often dominate due to limited access to land and resources and acid lime

growers are not an exception. These farmers who don't have greater access to land and capital, may specialise in crops such as acid lime as a profitable venture. The above results are similar to study conducted by Alemayehu (2016).

Production Regions of Acid Lime in India

The data in Table 2 specifies that, Andhra Pradesh had highest acid lime production with an average production of (630.29 mt) from 2011-12 to 2021-22 followed by Gujarat (533.28 mt), Karnataka (309.66 mt), Maharashtra (278.14 mt), Madhya Pradesh (263.63 mt), Telangana (220.48 mt) and Tamil Nadu (46.44 mt) with 20.62 per cent, 17.44 per cent 10.13 per cent, 9.10 per cent, 8.62 per cent, 7.21 per cent and 1.52 per cent, respectively (Anonymous, 2023a).

Table 2

Production regions of acid lime in India

Major production regions	Average production (MT) from 2011-12 to 2021-22
Andhra Pradesh	630.29 (20.62)
Gujarat	533.28 (17.44)
Karnataka	309.66 (10.13)
Maharashtra	278.14 (9.10)
Madhya Pradesh	263.63 (8.62)
Telangana	220.48 (7.21)
Tamil Nadu	46.44 (1.52)
Total	3057.28 (100)

Note : Figures in the parentheses are per cent to total production

The proactive support from the state government of Andhra Pradesh through agricultural schemes, subsidies and technical assistance had boosted acid lime production. Moreover, Andhra Pradesh's large agricultural landholding and focus on horticulture allow farmers to grow acid lime on a commercial scale, contributing to its leading position in India's acid lime production. Karnataka ranks third in acid lime production due to its moderate focus on horticulture, with smaller land holdings and less emphasis on intensive commercial acid lime cultivation compared to Andhra Pradesh. Aryal *et al*. (2021) also found that acid lime production was encouraged by government support in Nepal.

Major Markets of Acid Lime in India

The information in Table 3 shows that Andhra Pradesh (Anantapur, Kurnool, Kadapa, Prakasam and Nellore), Maharashtra (Jalgaon, Ahmednagar, Aurangabad and Nasik), Gujarat (Kheda, Anand and Vadodra), Karnataka (Dharwad, Belagavi and Vijayapura), Odisha (Cuttack and Puri) and Tamil Nadu (Dindigul, Coimbatore and Tirunelveli) as the major acid lime markets in the order they rank in acid lime production in India. These six states collectively account for about 70 per cent of countries acid lime production (Anonymous, 2023b).

Table 3

Major markets of acid lime in India

States	Major markets of acid lime
Andhra Pradesh	Anantapur, Kurnool, Kadapa, Prakasam, Nellore
Maharashtra	Jalgaon, Ahmednagar, Aurangabad, Nasik
Gujarat	Kheda, Anand, Vadodra
Karnataka	Dharwad, Belagavi, Vijayapura
Odisha	Cuttack, Puri
Tamil Nadu	Dindigul, Coimbatore, Tirunelveli

Ref : (Anonymous, 2023b)

These regions possess, conducive agro-climatic conditions for acid lime cultivation. Moreover in these regions proximity to and access urban markets facilitates efficient distribution, while government support in some states through initiatives and subsidies had boosted acid lime production. This combination of factors contributes to the prominence of these regions in the acid lime market. Findings of Vilhekar *et al*., 2022 also collaborate the factors as evident from the research.

Constraints Regarding Acid Lime Production in India

The production constraints faced by the acid lime farmers depicted in Table 4 tells that shortage of water in peak crop season was ranked first followed by high manual labour wage rate, Irregular supply of electricity, shortage of manual labour in future, change in rainfall distribution pattern, high cost of pesticides, inadequate technical assistance, high cost of fertilizers, non-availability of quality inputs, fragmentation and subdivision of landholdings which were ranked from second to tenth, respectively.

In marketing constraints, price fluctuations were ranked first followed by lack of market information, transportation issues, quality standards, low price for produce and high marketing costs were ranked second to sixth, respectively (Table 5).

In financial constraints (Table 6), inadequate access to institutional loans was ranked first followed by lack of facilities provided by horticulture department/ through NHM, scarcity of own funds and non-existence of extension network to horticulture department at grass root level like in the case of agriculture department (RSK), delay in loan sanction were ranked from second to fifth, respectively.

The production constraints faced by acid lime farmers stem from several interrelated factors. Water scarcity during peak season is the primary challenge, followed by high labour wage rates and irregular electricity supply. Future labour shortages, changing rainfall

TABLE 4

Production constraints regarding acid lime cultivation

Constraints	Mean Garrett's Score	Garrett's Rank
Shortage of water in peak crop season	73.78	I
High labour wage rate	71.82	II
Irregular supply of electricity	61.32	III
Shortage of labour manual in future	57.23	IV
Change in rainfall distribution pattern	56.10	V
High cost of pesticides	48.20	VI
Inadequate technical assistance	45.53	VII
High cost of fertilizers	31.65	VIII
Non-availability of quality inputs	30.60	IX
Fragmentation and subdivision of landholdings	23.77	X

TABLE 5

Marketing constraints faced by the acid lime producers

Constraints	Mean Garrett's Score	Garrett's Rank
Price fluctuations	66.28	I
Transportation issues	64.91	II
Lack of market information	62.80	III
Low price for produce	38.05	IV
Lack of proper quality standards	34.92	V
High marketing cost	33.03	VI

TABLE 6

Financial constraints faced by the acid lime producers

Constraints	Mean Garrett's Score	Garrett's Rank
Inadequate access to institutional loans	71.42	I
Lack of facility provided by horticulture department / through NHM	61.16	II
Scarcity of own fund	47.00	III
Non-existence of an extension network to horticulture department at grass root level like in the case of agriculture department (RSK)	35.83	IV
Delay in loan sanction	34.58	V

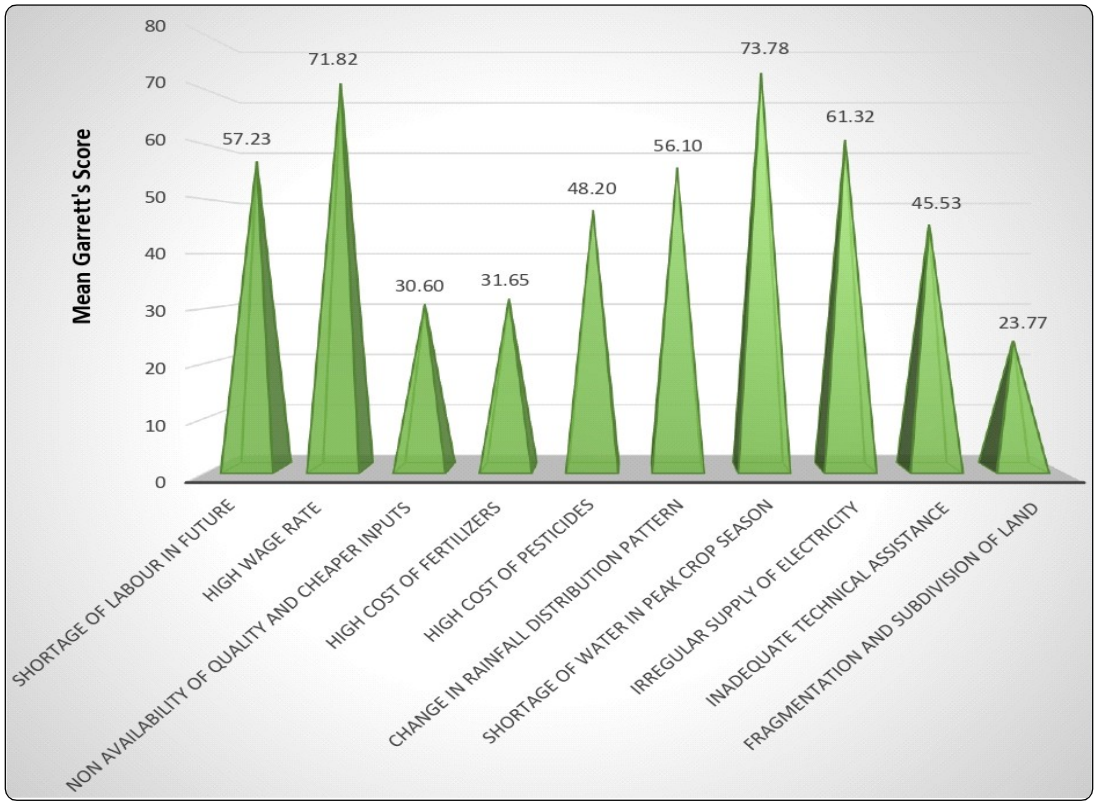

Fig. 5 : Production constraints

patterns and the high costs of pesticides and fertilizers further complicate their situation. Additionally, fragmentation of land holdings limits efficiency. In marketing, price fluctuations, lack of market information and transportation issues hinder profitability. Financial constraints include inadequate access to institutional loans, limited support from horticulture departments, scarcity of personal funds and delays in loan approvals, impacting overall farm sustainability and growth. The above results are similar to the studies conducted by Lekhanath (2016).

India is a leading producer of acid lime with major production regions including Andhra Pradesh, Maharashtra, Tamil Nadu and Gujarat. These states offer favorable climatic conditions and soil types

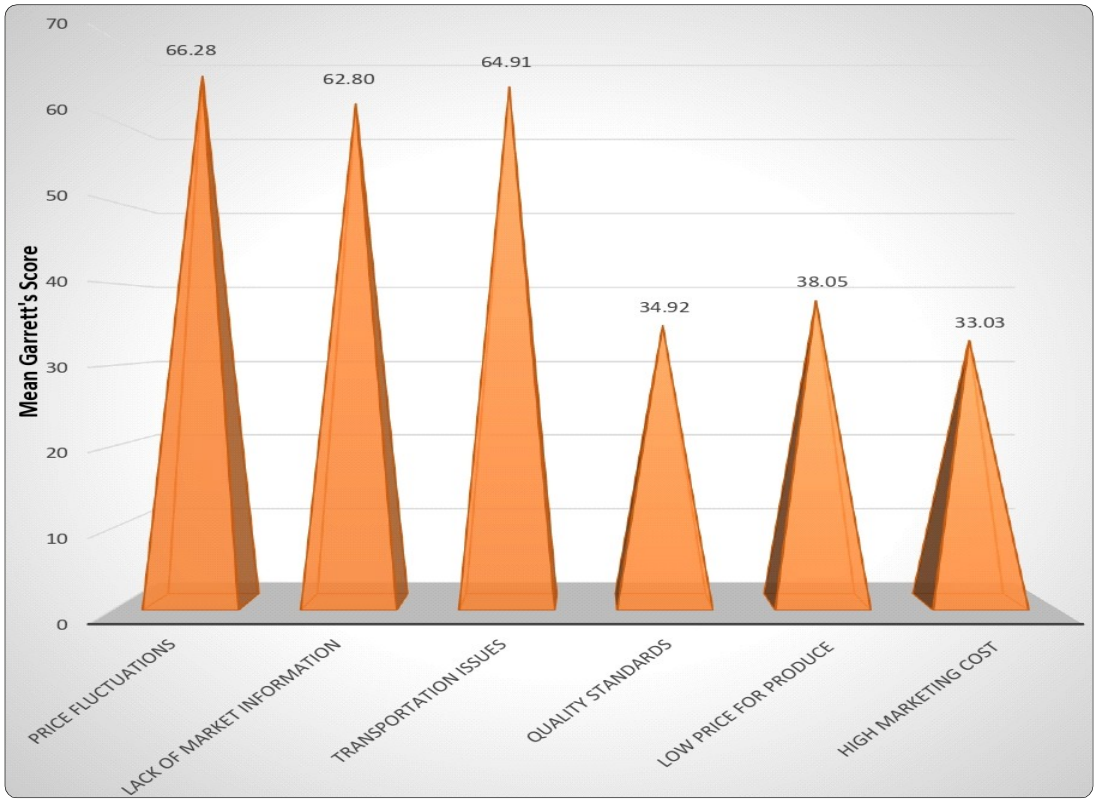

Fig. 6 : Marketing constraints

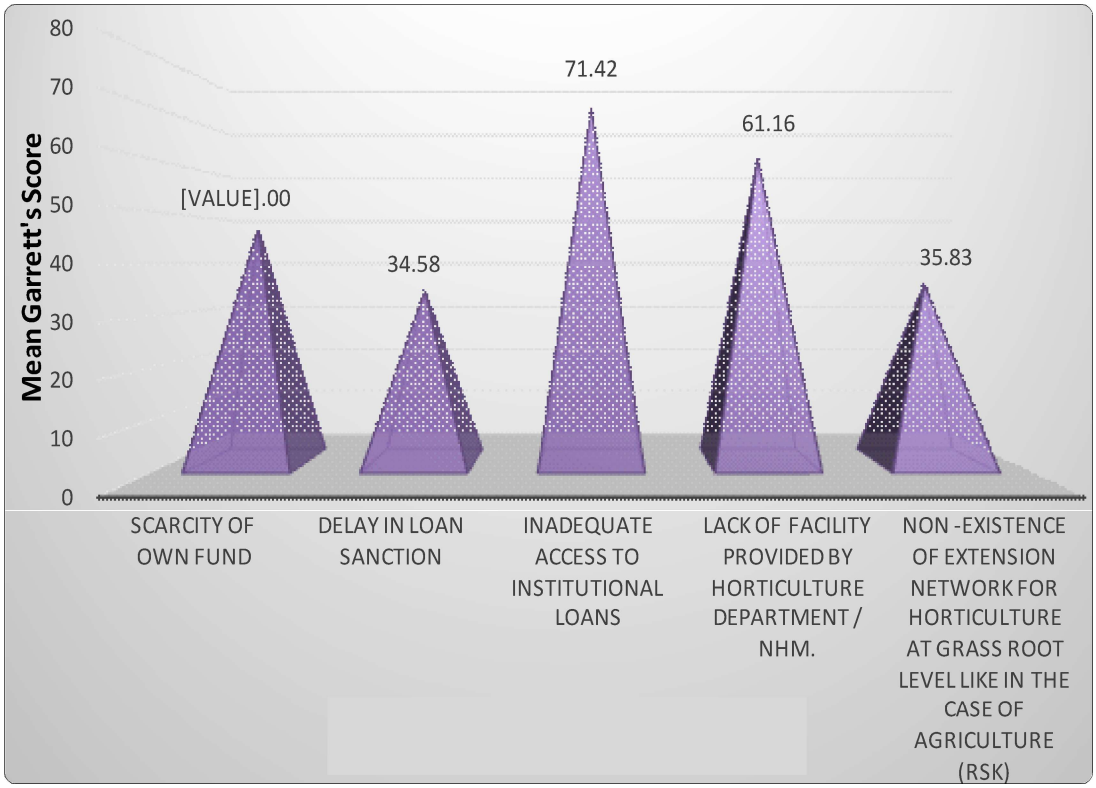

Fig. 7 : Financial constraints

suitable for acid lime cultivation. Key markets for acid lime include domestic consumption and export to neighboring countries and regions like the Middle East and Southeast Asia. However, the sector faces constraints such as fluctuating prices, pest and disease challenges and limited access to advanced agricultural practices and post-harvest technologies. Strengthening market linkages, improving supply chain efficiency and investing in developing advanced production technologies can help address these challenges and boost acid lime production / productivity in India.

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