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Constraints faced by fig growers and their suggestions for sustainable fig cultivation under climate variability in Maharashtra

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Abstract

Fig (*Ficus carica* L.) cultivation is gaining importance in Maharashtra; however, growers face multiple constraints that affect productivity and sustainability under conditions of climate variability. The present study aimed to identify the major constraints faced by fig growers and to document their suggestions for improving sustainable cultivation practices. Primary data were collected from fig growers and analysed using the Garrett ranking technique. The findings indicated that production and input constraints were the most severe, particularly the high cost of fertilizers and pesticides (63.14) and rising labour cost (55.86). Labour scarcity, irregular water supply (60.30), and climatic factors such as erratic rainfall (60.80) and temperature fluctuations also significantly affected yield and fruit quality. Pest incidence (59.40), lack of storage facilities (54.00), high perishability (55.00), and price fluctuations (54.00) further constrained fig cultivation. Financial limitations, inadequate market information, and lack of technical knowledge were also observed.

The overall ranking revealed that economic and resource-related constraints were more severe than knowledge and information-related constraints. Farmers suggested establishment of processing industries (83.72), development of cold storage facilities (80.56), and provision of timely market information (78.41) as key measures. The study emphasizes the need for strengthening input support, irrigation infrastructure, post-harvest management, and extension services to enhance resilience and sustainability of fig cultivation under climate variability.

Keywords: Fig cultivation, climate variability, Garrett ranking, production constraints, sustainable agriculture

Introduction

Fig (*Ficus carica* L.), popularly known as anjeer, is an important fruit crop belonging to the Moraceae family and is widely cultivated in tropical and subtropical regions. The fruit is highly valued for its rich nutritional composition, including dietary fibre, carbohydrates, essential minerals, and antioxidants, which has led to increasing demand among health-conscious consumers. Fig can be consumed fresh as well as processed into various value-added products such as dried figs, jams, and preserves, enhancing its economic importance. Owing to its early bearing habit, multiple harvests, and relatively short gestation period, fig cultivation offers considerable income potential for farmers. At the global level, fig production has shown a consistent upward trend, with annual output exceeding 1.3 million tonnes. Major fig-producing countries include Turkey, Egypt, Iran, and Afghanistan, which dominate both production and international trade (Food and Agriculture Organization, 2023). Despite having favourable agro-climatic conditions, India's contribution to the global fig

market remains relatively limited. In the country, fig cultivation is confined to approximately 4,000–5,000 hectares, with an annual production of about 50,000–60,000 tonnes. Maharashtra is the leading fig-producing state, accounting for nearly 70–80 per cent of the total national production. Within Maharashtra, Pune district serves as the principal hub of fig cultivation, particularly in Purandar and its surrounding areas, while Chhatrapati Sambhajnagar district is gradually emerging as an important region with expanding area under fig cultivation.

Despite its economic potential, fig cultivation is constrained by several production, post-harvest, and marketing challenges. The highly perishable nature of fresh figs results in a short shelf life, creating difficulties in storage, transportation, and marketing. Inadequate availability of cold storage facilities, processing units, and organized market systems leads to significant post-harvest losses. Farmers also face issues such as high input costs, labour scarcity, pest and disease incidence, and limited access to technical knowledge and improved cultivation practices.

In recent years, climatic variability—manifested through erratic rainfall, prolonged dry spells, and temperature fluctuations—has further intensified the challenges in fig cultivation. These changes adversely affect flowering, fruit set, development, and pest and disease dynamics, thereby reducing productivity and threatening the sustainability of fig-based farming systems.

Considering these challenges, a systematic understanding of the constraints faced by fig growers and their practical suggestions is essential for developing effective and location-specific interventions. Therefore, the present study was undertaken to analyse the constraints experienced by fig growers and document their suggestions for promoting sustainable fig cultivation under climate variability in Maharashtra.

Methodology

The present study was conducted in Pune and Chhatrapati Sambhajnagar districts of Maharashtra, which are major fig-growing regions of the state. An ex-post facto research design was adopted for the investigation.

A multistage sampling technique was employed. At the first stage, the two districts were selected purposively based on the area under fig cultivation. In the second stage, Purandar tahsil from Pune district and Chhatrapati Sambhajnagar and Gangapur tahsils from Chhatrapati Sambhajnagar district were selected due to higher concentration of fig growers. In the final stage, villages having significant area under fig cultivation were selected. From each selected village, 25 fig growers were randomly selected, constituting a total sample of 300 respondents.

Table 1: Selected Villages and Fig growers for study

Selected Districts	Selected Tahsils	Selected Villages	Fig Growers per Village	Total
Pune	Purandar	Sonori	25	150
		Jadhavwadi	25	
		Kalewadi	25	
		Guroli	25	
		Shingapur	25	
		Zendewadi	25	
Chhatrapati Sambhajnagar	Chhatrapati Sambhajnagar	Daulatabad	25	125
		Abdimandi	25	
		Kesapuri	25	
		Kesapuri Tanda	25	
		Fatiyabad	25	
	Gangapur	Rampuri	25	25
Total				300

Primary data were collected using a structured and pre-tested interview schedule designed to elicit information on constraints faced by fig growers under climate variability and their suggestions.

The data were analysed using frequency and percentage. The Garrett Ranking Technique was employed to prioritize the constraints. The ranks assigned by respondents were converted into percent positions using the formula:

$$\text{Per cent position} = 100 \times (R_{ij} - 0.5) / N_j$$

Where,

R_{ij} is the rank given for the i th item by the j th respondent

N_j is the total number of items ranked.

The percent positions were converted into Garrett scores using Garrett's conversion table. The mean Garrett score for each constraint was computed and used for final ranking. The constraint with the highest mean score was considered the most severe.

Results and Discussion

1. Production and Input Constraints

Production and input constraints refer to the high cost and limited availability of essential inputs required for fig cultivation.

Table 2: Garrett ranking of production and input constraints faced by fig growers

Sr. No.	Production and Input Constraints	Total Garrett Score	Average Garrett Score	Rank
1	High cost of fertilizers and pesticides	18942	63.14	I
2	Rising cost of labour	16758	55.86	II
3	High overall cost of cultivation	14583	48.61	III
4	High cost of planting material (saplings)	13980	46.60	IV
5	Limited availability of quality inputs	13200	44.00	V
6	Increasing cost of organic inputs	12630	42.10	VI
7	High cost of fertilizers application and equipment	12090	40.30	VII

High cost of fertilizers and pesticides (63.14) ranked first, followed by labour cost (55.86) and overall cost of cultivation (48.61), indicating significant economic pressure on fig growers. This may be attributed to increasing prices of agro-inputs, dependence on external inputs, and higher expenditure on plant protection measures under changing

climatic conditions.

2. Labour Constraints

Labour constraints refer to issues related to the availability, cost, and efficiency of skilled and unskilled labour.

Table 3: Garrett ranking of labour constraints faced by fig growers

Sr. No.	Labour Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Scarcity of skilled labour	17280	57.60	I
2	High wage rates	16590	55.30	II
3	Seasonal labour shortage	15360	51.20	III
4	Migration of labour to urban areas	14700	49.00	IV
5	Lack of trained labour for pruning	14100	47.00	V
6	Delay in farm operations due to labour	13560	45.20	VI

Scarcity of skilled labour (57.60) was the most severe constraint, followed by high wages (55.30). Migration and lack of skilled workers for pruning significantly affect orchard management and productivity.

3. Irrigation and Water Constraints

Irrigation and water constraints refer to problems associated with water availability, irrigation costs, and water management practices.

Table 4: Garrett ranking of irrigation and water constraints

Sr. No.	Irrigation and Water Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Irregular water supply	18090	60.30	I
2	High cost of irrigation	17280	57.60	II
3	Groundwater depletion	16320	54.40	III
4	Inadequate irrigation infrastructure	15600	52.00	IV
5	Power shortage for irrigation	14760	49.20	V
6	Limited adoption of micro-irrigation	13800	46.00	VI

Irregular water supply (60.30) ranked highest, followed by irrigation cost and groundwater depletion. Infrastructure gaps and energy shortages further constrain efficient water management.

4. Climatic and Environmental Constraints

Climatic and environmental constraints refer to the adverse effects of climate variability such as erratic rainfall, temperature fluctuations, and extreme weather events.

Table 5: Garrett ranking of climatic and environmental constraints

Sr. No.	Climatic and Environmental Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Erratic rainfall	18240	60.80	I
2	Temperature fluctuations	17460	58.20	II
3	Drought conditions	16020	53.40	III
4	Unseasonal rains	15360	51.20	IV
5	Heat waves affecting fruit quality	14700	49.00	V
6	Increased frequency of extreme events	13980	46.60	VI

Erratic rainfall (60.80) emerged as the major constraint, followed by temperature fluctuations. Unseasonal rains and extreme weather events negatively impact flowering, fruit set, and yield.

5. Pest and Disease Constraints

Pest and disease constraints refer to crop losses and management difficulties caused by pests, diseases, and inadequate control measures.

Table 6: Garrett ranking of pest and disease constraints

Sr. No.	Pest and Disease Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Increased pest incidence	17820	59.40	I
2	Disease outbreaks	16890	56.30	II
3	Lack of effective control measures	15930	53.10	III
4	High cost of plant protection chemicals	15000	50.00	IV
5	Resistance development in pests	14160	47.20	V
6	Lack of timely advisory services	13500	45.00	VI

Pest incidence (59.40) ranked first, followed by disease outbreaks. High cost of control measures and lack of timely advisory services further worsen crop protection challenges.

6. Infrastructure Constraints

Infrastructure constraints refer to the lack of essential physical facilities such as storage, transportation, roads, and market infrastructure.

Table 7: Garrett ranking of infrastructure constraints

Sr. No.	Infrastructure Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Lack of storage facilities	16200	54.00	I
2	Poor transportation	15360	51.20	II
3	Inadequate market infrastructure	14580	48.60	III
4	Lack of cold chain facilities	13860	46.20	IV
5	Poor road connectivity	13200	44.00	V

Storage facilities (54.00) were the most critical issue, followed by transportation problems. Lack of cold chain infrastructure leads to higher post-harvest losses.

7. Post-harvest and Storage Constraints: Post-harvest and storage constraints refer to issues related to perishability, storage, processing, and handling of produce after harvest.

Table 8: Garrett ranking of post-harvest and storage constraints

Sr. No.	Post-harvest Constraints	Total Garrett Score	Average Garrett Score	Rank
1	High perishability	16500	55.00	I
2	Lack of cold storage	15360	51.20	II
3	Post-harvest losses	14100	47.00	III
4	Poor grading and packaging	13560	45.20	IV
5	Lack of processing units	12900	43.00	V

Perishability (55.00) was the major issue, followed by storage limitations and post-harvest losses. Lack of processing and packaging reduces market value.

8. Marketing and Value Chain Constraints

Marketing and value chain constraints refer to challenges in marketing, price fluctuations, value addition, and weak market linkages.

Table 9: Garrett ranking of marketing and value chain constraints

Sr. No.	Marketing and Value Chain Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Price fluctuations	16200	54.00	I
2	Lack of processing facilities	15000	50.00	II
3	Limited value addition	13800	46.00	III
4	Dependence on middlemen	13200	44.00	IV
5	Lack of export opportunities	12600	42.00	V
6	Weak market linkages	12000	40.00	VI

Price fluctuation (54.00) ranked first, followed by lack of processing facilities. Dependence on middlemen and weak market linkages reduce farmers' income.

9. Financial and Investment Constraints

Financial and investment constraints refer to limited access to credit, high interest rates, and inadequate financial support for cultivation.

Table 10: Garrett ranking of financial constraints

Sr. No.	Financial Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Lack of credit facilities	12600	42.00	I
2	High interest rates	11700	39.00	II
3	Limited access to subsidies	11160	37.20	III
4	High initial investment	10500	35.00	IV
5	Delays in loan disbursement	9900	33.00	V

Lack of credit (42.00) ranked first, followed by high interest rates. Delayed financial support affects timely investment in fig cultivation.

10. Market Information Constraints

Market information constraints refer to the lack of timely and accurate market information, including price data and extension services.

Table 11: Garrett ranking of market information constraints

Sr. No.	Market Information Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Lack of price information	12000	40.00	I
2	Poor extension services	11190	37.30	II
3	Limited access to ICT tools	10500	35.00	III
4	Lack of awareness of market trends	9900	33.00	IV

Price information (40.00) ranked first, followed by extension gaps. Limited ICT access restricts farmers' ability to access real-time market data.

11. Knowledge and Orchard Management Constraints

Knowledge and orchard management constraints refer to gaps in technical knowledge, training, and scientific orchard management practices.

Table 12: Garrett ranking of knowledge and orchard management constraints

Sr. No.	Knowledge and Orchard Constraints	Total Garrett Score	Average Garrett Score	Rank
1	Lack of technical knowledge	12300	41.00	I
2	Poor orchard management practices	11100	37.00	II
3	Lack of training programs	10500	35.00	III
4	Inadequate knowledge of pruning	9900	33.00	IV
5	Limited awareness of climate adaptation	9300	31.00	V

Technical knowledge (41.00) ranked first, followed by orchard management issues. Lack of training and awareness of climate adaptation reduces productivity.

The overall ranking of different constraint themes was

Table 13: Overall Ranking of Constraint Themes Faced by Fig Growers

Sr. No.	Constraint	Total Garrett Score	Average Garrett Score	Rank
1	Production and Input Constraints	52470	58.30	I
2	Labour Constraints	19230	64.10	II
3	Irrigation and Water Constraints	18690	62.30	III
4	Climatic and Environmental Constraints	35700	59.50	IV
5	Pest and Disease Constraints	17100	57.00	V
6	Infrastructure Constraints	15360	51.20	VI
7	Post-harvest and Storage Constraints	14700	49.00	VII
8	Marketing and Value Chain Constraints	53280	44.40	VIII
9	Financial and Investment Constraints	11820	39.40	IX
10	Market Information Constraints	11190	37.30	X
11	Knowledge and Orchard Management Constraints	20730	34.50	XI

The overall ranking of constraint themes, based on total Garrett scores, revealed that production and input constraints ranked first, followed by labour constraints and irrigation and water constraints, indicating that economic and resource-related factors are the most critical challenges faced by fig growers. High input costs, increasing labour charges, and irregular water availability significantly affect the profitability and sustainability of fig cultivation.

Although labour constraints recorded a higher average Garrett score, production and input constraints secured the first rank due to their higher total Garrett score, reflecting their wider impact across respondents. Climatic and pest-related constraints were of moderate severity, while financial, market information, and knowledge-related

computed by aggregating the Garrett scores obtained for individual constraints under each category. The results are presented in Table 13.

constraints were comparatively less severe. However, these constraints remain important for improving long-term sustainability and adoption of improved practices.

Suggestions Provided by Fig Growers to Overcome Constraints

After identifying the major constraints, fig growers were asked to suggest measures to overcome these challenges. Being primary stakeholders, their field-level experience provides valuable insights for improving resilience, productivity, and sustainability of fig cultivation under climate variability. The suggestions are presented in Table 14.

Table 14: Suggestions provided by fig growers to overcome constraints

Sr. No.	Suggestions	Garrett Score (%)	Rank
1	Establish fig processing industries in major production areas	83.72	I
2	Develop cold storage facilities near production regions	80.56	II
3	Provide timely market information and stabilize prices of figs	78.41	III
4	Provide technical guidance and training on improved fig cultivation practices	75.93	IV
5	Supply fertilizers, pesticides and other inputs at subsidized rates	73.25	V
6	Promote drip irrigation and water harvesting structures for efficient water management	71.62	VI
7	Ensure regular electricity supply for irrigation purposes	69.48	VII
8	Encourage formation of farmer producer organizations (FPOs) for collective marketing	67.12	VIII
9	Provide timely credit and financial assistance to fig growers	64.37	IX
10	Develop improved and disease-resistant varieties of fig	61.84	X
11	Promote use of protective nets and bird control methods in orchards	58.76	XI
12	Strengthen extension services and farmer training programmes	55.93	XII

The Garrett ranking analysis of suggestions indicated that establishment of fig processing industries (83.72) was the most important suggestion, followed by development of cold storage facilities (80.56) and provision of timely market information with price stabilization (78.41). Farmers also emphasized the need for technical guidance and training (75.93) and subsidized inputs (73.25) to improve productivity. Other important suggestions included promotion of efficient water management practices, reliable electricity supply, formation of FPOs, and timely credit support. These suggestions highlight the need for integrated interventions involving infrastructure development, institutional support, and capacity building.

The study revealed that fig growers face major constraints related to input costs, labour, and water availability under climate variability. Climatic factors, pest and disease incidence, and infrastructural limitations further affect productivity. Farmers emphasized the need for processing industries, cold storage, market support, technical guidance, and institutional support. Strengthening infrastructure, extension services, and market systems is essential to improve sustainability and adaptive capacity of fig growers. The findings of the study provide important policy implications for promoting climate-resilient and sustainable fig cultivation in Maharashtra.

Future Scope

Further research should focus on developing climate-

Conclusion

resilient fig production practices, improving water management, and promoting stress-tolerant varieties. Studies on value chain development, processing, and market linkages are also needed to enhance farmers' income and ensure sustainable fig cultivation.

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