

## Lemon in Crisis? Exploring Karnataka's Lemon Legacy and the Road

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### Introduction

Lemon (*Citrus limon*) is not only a commonly consumed fruit but also a significant horticultural crop with diverse commercial and medicinal applications. It plays a vital role in Karnataka's agrarian economy by enhancing rural livelihoods, contributing to nutritional security, and serving as an income source for thousands of small and marginal farmers. As consumer awareness of health benefits associated with lemons grows, so does the relevance of this crop in both domestic and export markets.

In Karnataka, lemon cultivation has witnessed a blend of progressive adoption and stress-induced decline. Among the state's various regions, Vijayapura district dominates production, contributing an estimated 80% to the state's total output. The Kagzi lemon, native to the region, has received a prestigious Geographical Indication (GI) tag, signifying its unique quality attributes.



**Photo captured at Indi lemon Market, Vijayapura, Karnataka**

However, the sector is simultaneously grappling with multiple challenges. Erratic rainfall, depleting groundwater, and a gradual shift in cropping choices have threatened the long-term viability of lemon farming. This paper presents a detailed sectoral analysis, including production trends, inter-district comparisons, emerging challenges, and strategic policy interventions to sustain and enhance the lemon value chain in Karnataka.

## Area, Production, and Productivity

An examination of official data from the Directorate of Economics and Statistics highlights a consistent decline in the area under lemon cultivation in Karnataka over the past three years. While the productivity per hectare has remained somewhat stable, the shrinking cultivation area suggests waning interest among farmers:

**Table 1: Area, Production and Productivity of lemon in Karnataka**

Year	Area (ha)	Production (tonnes)	Productivity (Kg/ha)
2020-21	13668	100201	7331
2021-22	12813	91313	7127
2022-23	11497	81656	7102

**Source:** Directorate of Economics and Statistics, Karnataka (2022)

This downward trajectory in production is attributed to a combination of adverse weather conditions, higher cultivation costs, and limited institutional support. In spite of these challenges, the consistent productivity levels reflect the potential for technological and agronomic interventions to stabilize yields.

### Vijayapura: A Production Hub

Vijayapura district has emerged as the epicenter of lemon cultivation in Karnataka. In 2022–23, the district accounted for 9,394 hectares under lemon, producing 68,003 tonnes. Agro-ecological conditions, including well-drained soils and semi-arid climate, make the region ideal for lemon production. The district's lemon farmers are also known for their accumulated experience and use of locally adapted cultivation techniques.

The most celebrated cultivar in this region is the Kagzi lemon, particularly grown in Indi and its adjoining taluks. It is recognized for the following distinctive traits:

- Thin, soft rind, which enhances juicing efficiency
- High juice content, making it ideal for commercial extraction
- Elevated levels of ascorbic acid (Vitamin C), boosting its nutritional value

The GI-tagged Kagzi lemon commands a price premium in local and regional markets. Its recognition has not only improved marketing prospects but also instilled a sense of pride among producers, incentivizing quality maintenance.

### Climate Impact and Crop Diversification

Despite its commercial promise, lemon cultivation is vulnerable to environmental stress, particularly prolonged droughts and irregular rainfall patterns. Lemon trees have shallow root systems, making them highly susceptible to moisture deficits. A few successive years of drought can result in reduced flowering, fruit drop, and even tree mortality.

Consequently, many lemon growers, especially in Vijayapura, have shifted to grape cultivation. Grapes, although water-intensive during certain stages, offer higher returns and better market linkage. Between 2018–19 and 2022–23, the grape-growing area in Vijayapura surged from 17,000 hectares to 26,000 hectares. This shift represents a larger trend of diversification driven by economic rationality and risk mitigation.

The trend also illustrates a critical gap in climate-adaptive horticulture planning. Unless lemon cultivation is made more resilient through water-efficient technologies and climate insurance, such crop switches are likely to increase.

**Inter-district Comparison**

Though Vijayapura leads in terms of volume, several other districts show promising figures, especially in productivity. Comparative data from 2022–23 are presented below:

**Table 2: District-wise Area, Production and Productivity of lemon in Karnataka**

SL NO	DISTRICTS	Area ( ha)	Production (tonnes)	Productivity (Kg/ha)
1	Bagalkote	197	2557	12980
2	Bengaluru- Urban	8	57	7102
3	Bengaluru- Rural	42	298	7102
4	Belagavi	55	391	7102
5	Bellary	19	135	7102
6	Bidar	88	606	6890
7	Vijayapura	9394	68003	7239
8	Chamarajanagar	34	241	7102
9	Chickballapur	57	134	2357
10	Chikmagalur	38	270	7102
11	Chitradurga	127	981	7723
12	Dakshina Kannada	2	14	7102
13	Davangere	37	263	7102
14	Dharwad	7	50	7102
15	Gadag	39	277	7102
16	Kalaburgi	458	1023	2234
17	Hassan	29	206	7102
18	Haveri	18	128	7102
19	Kodagu	6	43	7102
20	Kolar	37	263	7102
21	Koppal	201	1385	6890
22	Mandya	28	199	7102
23	Mysore	19	135	7102
24	Raichur	109	764	7012
25	Ramanagaram	40	289	7232
26	Shivamogga	30	213	7102
27	Tumakuru	202	1483	7342
28	Udupi	6	43	7102
29	Uttara Kannada	7	50	7102
30	Vijayanagara	54	384	7102

31	Yadgir	109	772	7079
32	<b>Karnataka</b>	<b>11497</b>	<b>81656</b>	<b>7102</b>

Source: Directorate of Economics and Statistics, Karnataka (2022)

Notably, Bagalkote's exceptionally high productivity highlights the possibility of replicating successful agronomic practices across similar agro-climatic zones. These figures also indicate that targeted extension services can play a major role in enhancing district-level performance.

### **Constraints in the Lemon Supply Chain**

Lemon cultivation in Karnataka is impeded by various systemic constraints that affect both production and post-harvest phases:

- Volatile market prices during harvest seasons reduce income predictability.
- Inadequate cold storage and processing infrastructure leads to significant post-harvest losses.
- Dependence on middlemen due to weak direct market access results in farmers receiving low prices.
- Lack of Minimum Support Price (MSP) or assured procurement leaves growers exposed to market shocks.
- Limited access to weather-based crop insurance and agricultural credit restricts investment in input-intensive practices.

The existing supply chain lacks backward and forward integration. As a result, even producers with quality output struggle to realize optimal returns. Addressing these gaps is essential for incentivizing lemon cultivation.

### **Strategic Interventions for Sectoral Growth**

To unlock the full potential of Karnataka's lemon industry, a comprehensive strategy encompassing agronomic, infrastructural, and policy dimensions is required:

#### **1. Post-Harvest Management and Value Addition**

Establishing decentralized lemon processing units at the taluk level can support the production of high-value products such as lemon oil, lemon powder, juice concentrates, and pickles. These units can absorb surplus produce, create rural employment, and reduce waste.

#### **2. Market Development**

Enhancing access to wholesale and retail markets through e-platforms, cooperative marketing societies, and public-private partnerships can ensure better price realization. GI branding for Kagzi lemon can also be leveraged for export marketing.

### 3. Climate Resilience Measures

Promoting micro-irrigation, soil moisture retention techniques, and drought-resistant lemon cultivars can reduce vulnerability. Integrating climate-smart practices through training and extension programs will increase adoption.

### 4. Infrastructure Development

Investment in modern cold chains, refrigerated transport, and solar-powered storage units can mitigate post-harvest spoilage. Government support under horticulture missions should prioritize these needs.

### 5. Institutional Support

Strengthening Farmer Producer Organizations (FPOs) dedicated to lemon fruits can enhance collective bargaining power, facilitate input procurement at scale, and enable direct procurement tie-ups with large buyers and processors.

### 6. Research and Innovation

Collaborative research between agricultural universities and farmer groups should focus on pest-resistant lemon varieties, organic farming methods, and predictive models for climate risks. Pilot projects can serve as demonstration sites.

## Conclusion

The lemon industry in Karnataka stands at a critical juncture. While districts like Vijayapura exemplify the state's strengths in lemon production, emerging climatic and structural challenges pose serious threats to sustainability. Nonetheless, the sector retains immense growth potential, particularly with the premium positioning of the Kagzi lemon.

Realizing this potential requires a concerted push from all stakeholders—farmers, researchers, policymakers, and market actors. With robust policy frameworks, adaptive technologies, and grassroots-level institutional support, Karnataka can transform its lemon sector into a resilient and globally competitive agro-industry, securing long-term prosperity for its rural economy.

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