



ECONOMIC PERSPECTIVES ON LEMON CULTIVATION IN INDIA: GROWTH IN AREA, PRODUCTION, AND PRODUCTIVITY

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Abstract

India's booming lemon cultivation goes a long way in our agricultural economy, which makes India the highest lemon producer all across the globe. Those numbers in the area under cultivation expanded from 164,200 ha in the 2000 to 2001 financial year to 327,300 hectares in the year spanning 2020 to 2021, and all this was supported due to the rise in the demand from imports as well as exports. Unfortunately, productivity has always been below world standards, and this low productivity is a result of the lack of modern farming techniques, neglecting pest control, and less access to modern agricultural technologies. Andhra Pradesh, Gujarat, MP and Tamil Nadu consistently ranked as the highest lemon production states in the country, and all of them have managed to increase both area under cultivation and production. Andhra Pradesh is the highest, as there is a lot of irrigation, and also the lemon varieties cultivated there are grown in improved varieties. Some areas of the country do have certain challenges, which include the dominant pests, the lack of environmentally friendly farming practices, and the lack of farming infrastructure. Diversifying into lemon by-products like lemon zest and lemon essential oils, and also developing improved farming practices are some of the untapped opportunities. This research seeks to understand the area, production, and productivity trends of cultivation in India and also the regional performance of the country's top states and analyse the major challenges alongside opportunities from this lemon cultivation. The study is based on the secondary data sources such as reports on agriculture, scholarly works, and statistical analysis of the growth rate using the growth rate statistical tool to determine the trends in the years 2000-01 to 2020-21 and how the industry can be improved. The research finds that the level of technology adoption and the government assistance will be essential in helping to improve the level of productivity, profitability, and long-term sustainability of lemon growing in India.

Keywords: *Lemon Cultivation, Area, Production, Productivity, Growth Trends, Regional Disparities, Citrus Farming.*

Introduction

Lemon agriculture has domestic and export market opportunities which add value to the agricultural economy of India. India ranks first as a producer of lemons and holds an important status in citrus fruit production all over the world due to favourable climatic and agro conditions. The market demand for lemons in fresh and processed value-added forms like lemon juice and essential oils has been one of the motivating factors for the extension of lemon cultivation in India (Khan et al. 2021). Major lemon-producing states of India, like Andhra Pradesh, Gujarat, Madhya Pradesh, and Tamil Nadu, have in the recent few years increased cultivation and production, and India, as a result, has become one of the prominent countries in the world for lemon production. India's position in the lemon market has significantly increased (Sathya & Reddy, 2018).



The keys to understanding the economic dynamics of the industry are the trends in the area and the production and productivity of lemon cultivation in India. The cultivated area has been gradually increasing due to the favourable agro-climatic conditions, government support and increasing demand for citrus fruits (Bose & Sunder, 2020). Nevertheless, despite the increase in the cultivated land, the average productivity is less than other world lemon producers. This difference in productivity could be attributed to the way factors are categorised as old-fashioned farming techniques, pests and diseases, and modern technologies (Singh and Yadav, 2019). Adopting contemporary agricultural and farm practices would be a long step toward boosting the overall productivity of the industry that is experiencing a series of other problems.

Regional disparities in lemon production could also be traced throughout India, with such states as Gujarat and Andhra Pradesh leading in the production and productivity levels, and the rest of them being defined by the failure to cope with weather extremities and inadequate infrastructure (Ramaswamy & Nair, 2020). Indicatively, Andhra Pradesh is much more productive than the other lands due to the application of the advanced irrigation techniques and the application of superior lemon varieties (Thiruvengadam & Sreevani, 2022). Thus, while some states are struggling with exceeding their carrying capacity due to climate change, others are facing the issue of floods and pest attacks that reduce the harvest and quality of crops (Ghosh et al., 2021), as in the case of Assam or Odisha.

Other than these challenges, the lemon farming industry in India possesses a number of growth opportunities. Processing of lemon for value-added products like lemon juice, zest, and essential oils can also aid in improving the profitability for the lemon growers and help the farmers in getting a more diversified source of returns (Sharma and Singh, 2020). Furthermore, the innovations in post-harvest solutions, including the cold storage system as well as the improved transportation system, might assist in reducing the loss and improving the accessibility of the market for the farmers, in particular, in the remote areas. There is a bright future for lemon farming in India in the form of government programmes and policy measures that ought to be implemented in order to support the citrus farming industry and the research and design of new disease-resistant citrus varieties and climate-resistant practices (Chandra et al., 2021).

The aim of the paper is to identify the growth trend, production and productivity of lemon farming in India; assess the performance of major states in the production and identify the major weaknesses and opportunities of the industry. By analysing the economic opinions regarding lemon farming, the study is geared towards providing information on variables which influence the growth of the industry and their suggestions of how the sector can be more sustainable and profitable.

Literature Review

The latest research on lemon cultivation in different areas underlines the need to implement sustainable production, enhanced technologies, and advanced post-harvest management to increase both productivity and environmental performance. These researches are also concerned with the area, production and the productivity trends, and the main threats are found in the high cost of inputs, poor infrastructure and environmental demands, and opportunities for growth through varietal selection, technology use and better market access are also reported.

Garcia Castellanos et al. (2024) have concluded that Fino lemon was doing better in terms of productivity and environmental impact than Verna, and fertilisers increase the environmental burden significantly. Sekhar et al. (2024) also indicated high returns on citrus farming in Tamil Nadu, although the yields were low, and proposed the use of superior varieties and technology to improve product.



Sgroi et al. (2015) pointed out that organic lemon farming in Sicily is financially and environmentally sustainable and suggested the increased production of organic lemons with institutional support. Chiphang & Roy (2018) discovered that Kachai lemon growing in Manipur was economically viable, but it needed more cost-effective practices and good branding due to the high payback period. Thakur et al. (2023) observed an increase in the production of lemongrass in Bilaspur but cited that the cost of planting material was high and irrigation also was a hindrance, warranting further study on varieties and local processing. Renuka Meti (2019) found that lemon quality varied regionally in Karnataka, which may imply that selection of varieties is done in accordance with the strengths of the region. Begum and Marium (2022) in Bangladesh thought that the loss of post-harvesting was because of poor storage and transportation, and they suggested that infrastructure should be enhanced. Devi and Sangma (2024) have centred the commercial potential of Kachai lemon in Manipur and suggest that the post-harvest needs better support and branding strategies. Vijayapura has a solution to this issue; Abbihal et al. (2024) encouraged the valorisation of waste of lemon peels. Chikkalaki and Krishnamurthy (2023) addressed the problem of fruit farming in Vijayapura, including such potential solutions as improved irrigation and openness in the market. Lastly, Enah and Bose (2024) emphasised the adoption barriers to farmers of Kachai lemon farmers, which include rainwater harvesting and technical training. All in all, these papers emphasise the importance of better practices, adoption of technology, and more sustainable solutions to make lemon farming economically viable and sustainable.

Research Objectives

1. To study the area, production, and productivity trends of lemon cultivation in India.
2. To compare the regional performance of lemon cultivation across major states in India.
3. To identify the challenges and opportunities in lemon production and productivity.

Research Methodology

In this study, the research methodology will only be based on secondary data sources to examine the trends of lemon cultivation in India. The available agricultural reports, government publications, and other existing academic literature on lemon farming will be used to gather data by looking at aspects such as production, productivity, and performance of the region. To evaluate the changes in the cultivation area, the volumes and the productivity of the production annually, the growth rate statistical tool will be used to analyse the rates of changes between 2000 and 2021. The tool shall be used to assess the percentage change in these variables, and it will provide information on the growth or the decline in the lemon farming over time. The secondary data will be analysed through the Horticultural Statistics at a Glance and other sources that provide secondary data on the performance regionally.

Economic and Agricultural Advantages of Growing Lemons

The production of lemon has a lot of advantages in terms of economic and agriculture. Lemon, being a very diverse fruit, finds applications in many industries: food, cosmetics, pharmaceuticals and cleaning products. Lemon trees can be used in farming as a source of constant income since they are fruiting throughout the year and do not demand much maintenance. The demand for the fruit in the market is due to its high content of vitamin C and natural antioxidants that make it a favourite among health-conscious people. In addition to direct consumption, lemon by-products such as lemon juice, lemon zest, and lemon peel provide useful food processing as flavouring agents, natural preservatives, and even dietary supplements. Also, the growth of lemon can enhance the soil quality by adding organic matter to the soil since lemon trees are nitrogen-



fixing plants. Lemon also has some use in organic farming, where the leaves and peels are used as natural pesticides. In places with favourable climates, lemon production generates employment, local economies and enhanced agricultural export. Moreover, lemon production encourages the diversity of the environment and biodiversity because it does not require large amounts of pesticides in relation to other crops. In general, the use of lemon in agriculture is an economically, health- and environmentally advantageous activity that is practised in the different regions of the world.

Trends in Area, Production and Productivity of lemon:

Table.1: All India area, production and productivity of lemon

Year	Area (Ha)	Growth Rate	Production (Tonnes)	Growth Rate	Productivity (Kg/Ha)	Growth Rate
2000-01	1,64,200		13,77,200		8400	
2001-02	1,61,300	-1.77%	14,13,700	36,500	8800	400
2002-03	1,46,200	-9.36%	14,39,600	25,900	9800	1000
2003-04	1,67,800	14.77%	14,93,300	53,700	8900	-900
2004-05	78,900	-52.98%	10,33,100	-4,60,200	13100	4200
2005-06	2,68,700	240.56%	21,59,000	11,25,900	8000	-5100
2006-07	2,94,900	9.75%	23,10,200	1,51,200	7800	-200
2007-08	3,02,800	2.68%	25,01,700	1,91,500	8300	500
2008-09	3,16,100	4.39%	25,71,500	69,800	8100	-200
2009-10	2,95,600	-6.49%	26,29,200	57,700	8900	800
2010-11	2,19,000	-25.91%	21,08,000	-5,21,200	9600	700
2011-12	2,34,000	6.85%	22,72,100	1,64,100	9700	100
2012-13	2,55,200	9.06%	25,23,500	2,51,400	9900	200
2013-14	2,86,400	12.23%	28,35,000	3,11,500	9900	0
2014-15	2,68,400	-6.28%	29,50,400	1,15,400	11000	1100
2015-16	2,45,200	-8.64%	24,37,600	-5,12,800	9900	-1100
2016-17	2,48,200	1.22%	23,63,700	-73,900	9500	-400
2017-18	2,86,200	15.31%	31,48,500	7,84,800	11000	1500
2018-19	3,05,200	6.64%	34,82,100	3,33,600	11400	400
2019-20	3,22,100	5.54%	36,87,200	2,05,100	11400	0
2020-21	3,27,300	1.61%	35,48,400	-1,38,800	10800	-600

Source: Horticultural Statistics at a Glance 2021.

Note: Area in hectares, Production in tonnes and productivity in kilogram per hectare

The data presented in Table 1 shows the area, production, and productivity of lemons in India from 2000 to 2021. The area under lemon cultivation exhibited significant fluctuations during this period. In 2000-01, the area was around 164,200 hectares, and there were declines in the following years, reaching a low of 78,900 hectares in 2004-05. However, starting from 2005-06, there was a sharp increase in the area of cultivation, with a dramatic growth rate of 240.56%, bringing the area to 268,700 hectares. From that point on, the area continued to increase steadily, peaking at 327,300 hectares in 2020-21. This highlights a major expansion in lemon cultivation over the years, despite a few years of decline.



Production also saw notable fluctuations, reflecting both the expansion of cultivation area and the challenges in production levels. In 2000-01, the production was 13,77,200 tonnes, and it saw steady growth in subsequent years, reaching 21,59,000 tonnes in 2005-06, a period of significant area expansion. Despite this increase in area, the production did not always follow a consistent upward trend. For instance, in 2010-11, there was a notable dip, with production decreasing by 521,200 tonnes. However, the highest production of 36,87,200 tonnes was observed in 2019-20, showing that while production growth was irregular, it ultimately rose in the most recent years.

Regarding productivity (kg/ha), the data shows a gradual increase from 8,400 kg/ha in 2000-01 to 11,400 kg/ha in 2018-19. The highest productivity of 11,000 kg/ha was recorded in 2014-15. However, in 2020-21, the productivity decreased slightly to 10,800 kg/ha, a reduction of 600 kg/ha from the previous year. This is a fall in productivity, although the area and production are increasing, implying that although the area increase has led to greater production, there has been a problem in maximising the yields, and this could be because of the environment, or there could be some inefficiency in the cultivation practices. The general trend shows that there were positive changes in lemon agriculture, and certain issues related to productivity needed to be raised within the past few years.

Chart 1: Area (Hactare)

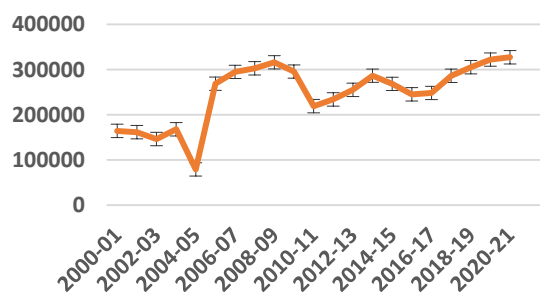


Chart 2: Production (Tonnes)

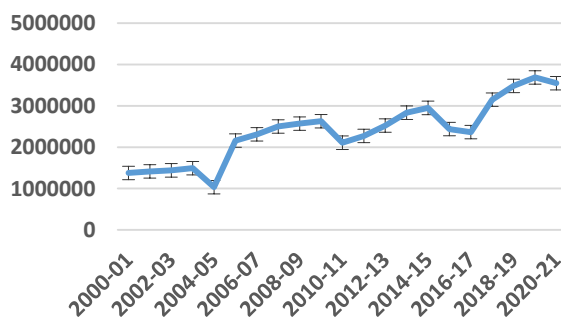


Chart 3: Productivity (Kg/Ha)

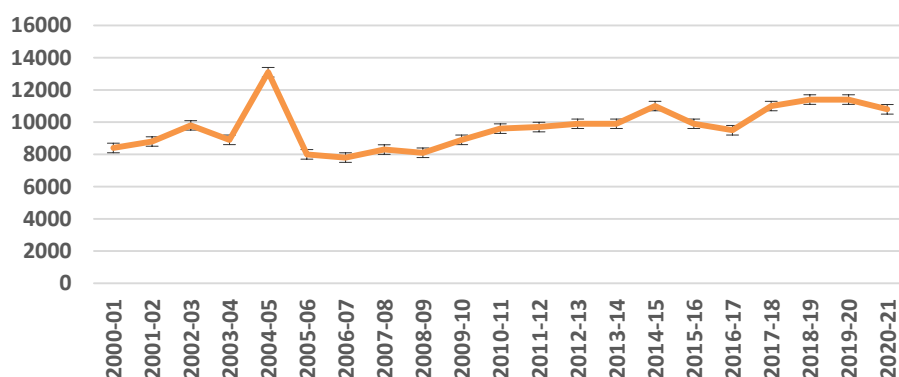




Table 2: State Wise Area, Production and Productivity of Lemon (2017-18 to 2020-21)

S. No.	State/UTs	2017-18			2018-19			2019-20			2020-21		
		Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity	Area	Production	Productivity
1	ANDHRA PRADESH	34,880	5,62,010	16,110	38,230	6,11,740	16,000	43,040	6,88,700	16,000	43,040	6,88,700	16,000
2	ARUNACHAL PRADESH	160	110	660	180	120	670	180	120	670	180	120	670
3	ASSAM	13,300	1,12,400	8,450	13,800	1,19,320	8,640	15,710	1,55,080	9,870	15,870	1,56,870	9,880
4	BIHAR	18,290	1,13,190	6,190	18,640	1,11,210	5,970	19,410	1,15,310	5,940	19,310	1,14,960	5,950
5	CHHATTISGARH	13,310	1,08,300	8,140	12,640	1,03,050	8,150	12,680	91,590	7,220	12,100	1,02,220	8,450
6	GUJARAT	46,280	6,05,620	13,090	47,430	6,21,660	13,110	48,780	6,36,020	13,040	48,500	6,25,830	12,900
7	HIMACHAL	11,550	6,720	580	11,660	7,490	640	11,830	9,060	770	12,280	8,750	710
8	JAMMU & KASHMIR	4,970	12,740	2,560	5,070	11,930	2,350	5,230	11,130	2,130	5,310	11,350	2,140
9	JHARKHAND	7,160	54,600	7,630	5,100	83,330	16,350	7,320	88,550	12,100	7,080	86,500	12,220
10	KARNATAKA	13,100	3,06,210	23,370	16,620	4,02,310	24,210	15,470	3,60,190	23,280	14,220	3,30,470	23,240
11	KERALA	500	460	930	1,150	1,010	880	1,150	1,010	880	1,170	1,210	1,040
12	MADHYA PRADESH	20,290	3,06,730	15,120	21,560	3,26,980	15,160	22,330	3,40,350	15,240	23,680	3,58,700	15,150
13	MAHARASHTRA	27,270	2,50,620	9,190	29,340	2,64,770	9,020	34,060	4,15,020	12,190	33,300	3,24,700	9,750
14	MANIPUR	6,240	66,950	10,730	6,080	56,750	9,340	6,090	58,640	9,630	5,950	63,810	10,720
15	MEGHALAYA	1,190	4,940	4,150	1,190	4,880	4,110	1,200	4,920	4,110	1,200	4,950	4,120
16	MIZORAM	8,100	25,900	3,200	8,100	25,900	3,200	8,120	25,900	3,190	8,120	25,900	3,190
17	NAGALAND	960	7,510	7,840	830	6,180	7,470	840	6,610	7,910	770	6,190	8,050
18	ODISHA	26,950	2,59,830	9,640	26,310	2,56,230	9,740	25,300	2,67,830	10,580	25,710	2,88,030	11,200
19	PUNJAB	990	7,620	7,740	1,100	8,540	7,750	1,250	9,650	7,750	2,660	21,300	8,020
20	RAJASTHAN	2,690	14,470	5,380	2,490	14,820	5,960	2,760	23,110	8,370	3,030	21,750	7,180
21	TAMIL NADU	9,650	1,18,460	12,270	9,460	1,51,610	16,030	11,070	1,56,430	14,130	11,760	34,790	2,960
22	TELANGANA	13,430	1,78,250	13,270	12,730	1,73,580	13,640	12,280	2,43,480	19,830	8,740	1,50,720	17,250
23	TRIPURA	4,770	24,210	5,070	4,970	23,970	4,820	4,970	23,930	4,820	5,060	24,400	4,820
24	WEST BENGAL				10,530	94,570	8980	10,870	94,780	8,720	18,060	95,270	5,280
25	OTHERS	170	640	3,800	20	170	7,520	150	510	3,380	160	890	5,480
	TOTAL	2,86,200	31,48,490	1,95,110	3,05,230	34,82,120	2,19,710	3,22,090	38,27,920	2,21,750	3,27,260	35,48,380	2,06,370

Source: Horticultural Statistics at a Glance 2021

Note: Area in hectares, Production in tonnes and productivity in kilogram per hectare

The data in Table 2 presents the area, production, and productivity of lemons across different states/UTs in India for four consecutive years (2017-2021). Andhra Pradesh has consistently ranked as the highest contributor in terms of area, production, and productivity throughout the years. In 2020-21, the state maintained 43,040 hectares of area, yielding 688,700 metric tonnes of lemons, with a productivity rate of 16,000 kg per hectare. This reflects a stable contribution to India's lemon production, indicating the state's strong agricultural output in this sector.

The production levels in Kerala and Himachal Pradesh are low as compared to the bigger agrarian states. In an example like Kerala alone, only 500 hectares of area were reported this season (2017-18) with a small-scale production of 460 metric tonnes. In the following years, the cultivated area and output increased modestly, reaching a high of 1,170 hectares and 1,210 metric tonnes of particulates in



2020-21. But despite these increments, productivity was still low at 1,040 kilogrammes per hectare. Himachal Pradesh was no exception in this pattern, with the highest production of just 710 kilogrammes per hectare in 2020-21, despite a slight increase in area and production over the years.

On the other hand, their shifts in production capacities are more pronounced in such states as Gujarat and Maharashtra. The productivity of Gujarat, which ranged between 46,280 hectares in 2017-18 and 48,500 hectares in 2020-21, respectively, dropped slightly to 13,090 kilogrammes per hectare. Likewise, the growth of both area and production appears in Maharashtra, although its productiveness decreased slightly, from 9,190 kilogrammes per hectare in 2017-18 to 9,750 kg per hectare in 2020-21. These differences distinguish between the different tendencies in regional agricultural performance and underline the possible need for specific reforms in the productivity management of these states.

Major findings of the study

The lemon farming in India is a significant part of the agricultural economy of the country, making the country the largest lemon producer in the world. There has been a tremendous increase in the cultivation, production, and productivity of the area over the years, with the key states that produce lemons being Andhra Pradesh, Gujarat, Madhya Pradesh, and Tamil Nadu. The land that is currently cultivated under lemon trees has grown significantly in size, from 1,64,200 hectares in 2000-01 to 3,27,300 hectares in 2020-21 due to the growing demand of lemons in the domestic market and in export. Nonetheless, the average productivity per hectare in this region has not been increasing at the same pace as other world producers, which means that the farming activities and implementation of technologies are ineffective.

There is a fluctuation in the yearly production and the productivity of lemon culture. As an example, the overall production of lemons was maximum in 2019-20, with a total of 36,87,200 tonnes, and maximum productivity has been exhibiting some irregularities in recent years. It had a sluggish growth in productivity per hectare with an increase of 8,400 kg/ha in 2000-01 and 11,400 kg/ha in 2018-19 but decreased slightly to 10,800 kg/ha in 2020-21. It means that the area under cultivation has increased, but the yield per hectare has remained low, which is probably explained by the failure to use modern methods of agriculture, pest problems, and the environment.

India boasts of observable variations in lemon production regionally. Andhra Pradesh is always on top of the list in terms of area and production as well as productivity and has sustained high rates of lemon cultivation and exhibited good agricultural production. An example is that in 2020-21, Andhra Pradesh had 43,040 hectares, and productivity was 16,000 kg/ha. On the contrary, low productivity rates have been experienced in the following states: Kerala, Himachal Pradesh and Bihar. Kerala is an example, holding a minor territory and output, and in 2020-21, the productivity rate of Kerala stands at only 1040 kg/ha. Similarly, despite other states like Gujarat and Maharashtra showing remarkable gains in the progression of their lemon farms, there is no guarantee in the regions' growth in terms of productivity, a factor that demonstrates they should embrace better management principles.

Challenges and Opportunities of lemon cultivation

The problems of the business are multifaceted. The lack of productivity in some areas is caused by obsolete agricultural practices, the presence of pests and diseases, and inappropriate weather conditions, amongst other reasons. Additional state-related problems like heavy rains and pest attacks also affect other states like Assam and Odisha and mostly influence production and quality.



Conversely, the possible reason provided for the high productivity in Andhra Pradesh is that there are new advanced irrigation methods and uses of better varieties of lemon. To overcome these, agriculture should be modernised; pest containment through investment in pest management as well as application of climate-resistant measures would be favourable to the industry. The lemon farming sector in India, however, is an untapped market laden with opportunities to exploit.

One of the potential opportunities and milestones that could assist in enhancing income and enabling farmers to receive a constant income is the creation of added products such as lemon juice, lemon zest, and lemon essential oils. Besides, the engineers would assist in cutting down on losses through the advancement of post-harvest technologies like better storage and transportation facilities and help provide the farmers with easier access to the markets with remote locations too. The government should further intervene to promote citrus farming and study the disease-resistant types and any weather-relevant techniques to make it more sustainable and profitable in the long term.

There is great economic benefit to the farming of lemon. Lemon by-products are also being used in other industries other than direct usage, like food, pharmaceuticals and cosmetics. Lemons are rich in vitamin C and antioxidants and are very prevalent among the health-conscious clientele. In addition, lemon production is a commodity that does not pollute nature; lemon trees are nitrogen-fixing crops that increase soil fertility and do not need an enormous quantity of pesticides like other crops. Not only does lemon farming increase agricultural exportation, but it also offers a more effective solution to farming since it enhances biodiversity and boosts local economies. This is why the production of lemons is among the significant elements of the Indian agricultural and economic sector and has colossal prospects of growth and innovation.

Suggestions for enhancing production and productivity

- **Adopting Modern Agriculture Techniques:** In the majority of places archaic forms of agriculture still persist. Newer forms of sustainable farming, such as precision farming and automated irrigation, will also help us to grow production on a per hectare basis and make optimal use of resources.
- **Improve Pest and Disease Management:** Pest infestations and disease outbreaks are some of the reasons for low yield. Implementation of biopesticides, crop rotation, and resistant varieties will help to keep losses to crops to a minimum, and the quality of the crop will also be enhanced through the use of integrated pest management (IPM) methods.
- **Climate-Resistant Agricultural Operations:** Unfavourable climatic conditions such as excessive rainfall and temperature fluctuations may decrease lemon production. Other practices such as rainwater harvesting, mulching and the application of soil conservation methods will aid in curbing challenges to the environment through the development of climate-resistant lemon varieties.
- **Invest in Irrigation Systems:** Areas that are not productive, like Assam and Odisha, have difficulties to do with water supply. With the increased irrigation facilities, particularly drip irrigation systems, the supply of water can be guaranteed, and the total productivity is enhanced.
- **Diversification into Value-Added Products:** To maximise profit, it is advisable to encourage farmers to diversify into value-added lemon products such as juice, zest and essential oils. These products are more in demand in the market and provide farmers with a consistent income stream, particularly during periods when they are not in season.



- **Improve Post-Harvest Technologies:** Post-harvest management can be improved with investment in cold storage, packaging and transportation infrastructure to reduce losses, maintain quality and increase shelf life so that farmers better serve distant markets.
- **Disease-Resistant Varieties Research and Development (R&D):** Funding research on disease-resistant lemon varieties and the better methods of cultivation will assist in addressing the problem of productivity. In order to grow sustainably, R&D on new cultivars making them more resistant to pests and diseases will be important.
- **Government Support and Policy Programmes:** The sector can further be supported with enhancement of the government policies and financial incentives to adopt the technology, improving the infrastructure and training the farmers. This may involve subsidising the modern equipment or low-interest loans on the installation of irrigation systems.
- **Improve Regional Inequality in Productivity:** By highlighting low-productivity states (such as Kerala and Himachal Pradesh) through the introduction of best practices in high-performing states (such as Andhra Pradesh), the output of the different regions would be balanced and the aggregate production boosted.

Conclusion

Over the years, the lemon cultivation industry in India has experienced serious growth, both in terms of land area cultivated and production in general. Nonetheless, even with this increase, the productivity per hectare has not been in steady advancement with the international norms. The implementation of old-fashioned farming methods, pest and disease infestation, and the environment has contributed to the limitation of the potential of lemon farming. The modernisation of agricultural processes, research in the field of pest control, and switching to climate-resistant agricultural methods are a few measures that will help to increase productivity and sustainability. There are also regional inequalities in production, as some of the states, such as Andhra Pradesh, are very productive, whereas others are struggling because of unfavourable climatic conditions and poor infrastructure.

In spite of these, the sector has massive opportunities for growth. Farmers can diversify their products to value-added products such as lemon juice, zest and essential oils, which can enable them to maximise their profits and streamline revenue flows. In addition, the industry can be strengthened by enhancing the post-harvest technologies and government assistance in the form of policies and financial incentives. As further investment is made in contemporary farming techniques, pest control, and disease-resistant strains, the lemon production industry in India has a high potential for future growth and economic profitability.

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