A Study on Growth Performance of Betel Leaf Production in Namakkal District

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***Abstract*—Betel leaf cultivation, a key agricultural activity in Tamil Nadu, significantly contributes to both the State economy and cultural practices. This study examines the area, production, and productivity of betel leaf farming in Tamil Nadu, with a particular focus on Namakkal district, which has emerged as a leader in cultivation despite statewide declines. The research utilizes secondary data from the period 2010-2022, sourced from the reports of Horticulture Department of Tamil Nadu, to analyze trends and regional contributions to betel leaf farming. Results indicate that while the overall area and production of betel leaves in Tamil Nadu have decreased, Namakkal has consistently increased its share in both cultivated area and production. Furthermore, Namakkal has shown resilience by maintaining higher productivity levels than the state average, with productivity peaking at 129.7 per cent of the state level in 2016-17. The study also compares the top ten districts in Tamil Nadu based on area, production, and productivity, highlighting the dominance of districts like Namakkal, Karur, and Thanjavur. The findings suggest that despite challenges, such as fluctuating production and declining cultivated areas in many regions, Namakkal is success can be attributed to efficient farming practices and better support systems. The paper concludes by recommending measures for promoting sustainable betel vine cultivation across the state, focusing on improved agronomic practices, infrastructure, and market access to enhance both productivity and profitability in Tamil Nadu betel leaf farming sector.**

***Index Terms*—Betel Leaf Cultivation, Namakkal District, Agricultural Trends, Horticulture Data**

I. INTRODUCTION

The scientific name of betel vine is Piper betle L. belongs to the family Piperaceae, that is the Black Pepper family. In spite of its alienness, the plant is much more popular in India than in any other country of the world since the antiquity. This would be evident from the numerous citations laid down in the ancient literature, particularly the Indian scriptures (Kirtikar & Basu 1993). Betel Leaves hold significant cultural and medicinal importance across various contexts in South Asia. In traditional practices, they are often offered in rituals to seek divine insight or prosperity. In Ayurveda and health remedies, these leaves are recognized for their digestive benefits and therapeutic properties. They're also a symbol of respect in rituals and social contexts, commonly chewed alongside areca nuts. Overall, Betel Leaves embody both tradition and health benefits, reflecting their multifaceted roles in South Asian culture (https://www.wisdomlib.org, 2025). The betel leaf grows on a vine that makes roots. In India, betel leaves, which are heart-shaped and dark green, are also referred to as paan (Khan et al., 2012). In addition to several other nations including Malaysia, Shri Lanka, the Philippine Islands, Bangladesh, and Myanmar, in India states like Odisha, Tamil Nadu, Madhya Pradesh, Uttar Pradesh, and Maharashtra are reported to have extensive betel leaf farming (Madhumita et al., 2020). India consumes 15–20 million betel leaves (Piper betel) annually, and the country farms betel leaves on an area of 50,000 hectares annually for a total value of 9 billion rupees (Mazumder, 2016).

II. PRODUCTION AND INTERNATIONAL TRADE

Betel vine is commercially cultivated in countries such as India, Bangladesh, Pakistan, Malaysia, Indonesia,

Sri Lanka, Thailand, Papua New Guinea, Madagascar, Bourbon and the West Indies. India is the major producer, where it is cultivated in an area of 43,000 ha, with an annual production worth Rs. 7,000 million. Bangladesh is the second largest producer. Sri Lanka is also a major producer, which exports most of its produce to Pakistan. In India the crop is extensively cultivated in the states of Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Assam, Orissa, Rajastan, Tamil Nadu, Uttar Pradesh and West Bengal. Countries such as Oman, Kuwait, Quatar, Saudi Arabia, the UAE, the UK, the USA and Nepal are the main importers. Improving the quality of the leaves, proper pre- and post-harvest handling, and improved methods of packing, storage and transportation can make manifold increase in the export of betel leaves (https://www.sciencedirect.com).

III. BETEL LEAF CULTIVATION IN TAMIL NADU

Tamil Nadu is one of the leading betel leaves cultivating state. Classified as a plantation crop, betel leaf occupies two per cent of net cultivated area in the state. In Tamil Nadu betel vine is grown largely along with the river basins on the basis of the districts of Namakkal, Karur, Tanjavur, Dharmapuri, Tiruchirappalli, Madurai, Krishanagiri, Salem, Thuthukudi, Cuddalore. Betel vine is a lucrative crop as it fetches attractive price in the market. Based on the theoretical framework, the present work is an attempt in this direction. Around 22,291 Hectares, more than 4,75,666 Metric tonnes and 244.3 productivity of betel leaves are cultivated in Tamil Nadu in the year of 2010-2022.

IV. REVIEW OF LITERATURE

Sahaya Princy & Banu, (2019) found that betel leaf production is economically unviable due to its quick spoilage and perishability, low endurance under unfavorable weather conditions, and low demand due to minimal damage. This leads to a significant drop in the price of betel leaf, causing numerous marketing issues. The agricultural market for betel leaf is characterized by a large concentration of intermediaries, lack of storage facilities, lack of market knowledge, improperly organized market, and expensive transportation. E-marketing, an electronic trade gateway for agricultural goods, can help resolve these issues by providing a more efficient and effective marketing channel. The use of the internet to sell agricultural goods is evolving the agriculture industry's marketing channels.

Dey et al., (2022) stated that, the betel leaf, a commercial horticulture crop with significant economic potential, is crucial in Ayurveda medicine and cultural customs. Odisha, a state producing the most betel leaves, is economically affected by this crop. A study involving sixty farmers found that the initial costs were higher due to increased costs associated with baroj construction. The net return of the crop increased as its economic life increased. The Cobb-Douglas production function was used to examine resource utilization efficiency, with seed being the most cost-effective resource. The two main marketing channels used in the region were Producer-Wholesaler-Retailer-Consumer and Producer-Pre-Harvest Contractor-Wholesaler-Retailer-Consumer. Garett's ranking approach revealed limitations, with illness severity and pricing changes impeding optimal production and marketing. Despite its potential to generate foreign exchange, policymakers and experts show little interest in betel leaf. This article aimed to analyze its economic potential to help policymakers understand its importance in the rural economy.

Mridha et al., (2005) aimed to assess the profitability of betel leaf production in Bangladesh among three age groups: young Boroj (under five years old), mid-aged Boroj (between six and fifteen years old), and elderly Boroj (over fifteen years old). The study was conducted in three settlements, Maria, Chaubania, and Raipara, and 120 betel leaf farmers were selected using a stratified random sampling approach. Primary data was collected from January to June 2001. A cost and return analysis were conducted, and the Cobb-Douglas production function was used to calculate the contributions of important inputs to betel leaf production. The results showed that betel leaf production was a lucrative industry, with new Boroj being more profitable than mid-aged and old Boroj. The calculated R2 and F-value also confirmed a large input consumption on betel leaf output.

V. STATEMENT OF THE PROBLEM

Despite various studies contacted in the field of agricultural economics there is limited research on the factors influencing the growth, productivity, and economic sustainability of betel leaf cultivation in Namakkal District. This study aims to analyze the various factors that affect the growth and contribute to the performance of betel leaf production in the region, including agronomic practices, economic viability, challenges faced by producers, and the impact of market dynamics on profitability. Understanding these aspects will provide insights into the potential for enhancing the productivity and sustainability of betel leaf farming in Namakkal District.

VI. OBJECTIVES OF THE STUDY

1. To examine the area, production and productivity of betel leaf cultivation in Tamil
Nadu.
2. To study the contribution of Namakkal district in the betel leaf cultivation in Tamil Nadu.
3. To examine the top ten district wise performance of betel leaf cultivation in Tamil Nadu.
4. To suggest the measures for the promotion of betel vine cultivation in the state.

Data and Methodology

The study is based on secondary data for a period of 12 years from 2010-11 to 2021-22. The secondary data were collected from the records of horticulture department of Tamil Nadu. The collected data were analyzed with the help of statistical tools like Annual Growth Rate, Compound Annual Growth Rate and Percentage Analysis.

VII. RESULTS AND DISCUSSION

Table 1 Area, Production and Productivity of Betel Leaf in India Major Producing States during the Year 2021-22

State	Area (HA)	Production (MT)	Productivity (MT/HA)
West Bengal	19,313	6,64,445	34.40
Andhra Pradesh	2,138	51,322	24.00
Karnataka	6,255	49,470	7.91
Odisha	2,741	41,055	14.98
Uttar Pradesh	265	21,245	80.17
Kerala	256	9,150	35.74
Tripura	584	7,942	13.60
Tamil Nadu	1,562	5,523	3.54
Nagaland	125	444	3.55
Madhya Pradesh	572	355	0.62
Telangana	9	162	18
Total	33,820	8,51,113	236.52

Source: DASD, DA&FW

The analysis revealed that the state-wise data on area, production, and productivity of betel leaf shows clear regional variations. West Bengal leads in both area and production, reflecting its dominance in cultivation. Uttar Pradesh, despite having a smaller cultivation area, records the highest productivity (80.17 MT/HA), indicating efficient farming practices. Conversely, Madhya Pradesh registers the lowest productivity (0.62 MT/HA), suggesting possible inefficiencies or unfavorable growing conditions. States such as Kerala and Andhra Pradesh also exhibit relatively high productivity levels. Overall, the findings indicate significant regional disparities in agricultural efficiency and highlight the potential for productivity improvements in states with larger cultivation areas but lower yields.

Table 2 Area, Production, and Productivity of Betel Leaf in Tamil Nadu during the year 2010-11 to 2021-22

Year	Total Area (in Hectares)	AGR	Total Production (in Metric Tonnes)	AGR	Total Production (in Metric Tonnes/Hectares)	AGR
2010-11	2,582	-	64,550	-	25	-
2011-12	2,374	-8.06	59,350	-8.06	25	-75
2012-13	2,474	4.21	61,850	4.21	25	0
2013-14	2,135	-13.70	59,780	-3.35	28	12
2014-15	1,826	-14.47	51,130	-14.47	28	0
2015-16	1,731	-5.20	48,468	-5.21	28	0
2016-17	1,630	-5.83	19,855	-59.03	12.18	-56.5
2017-18	1,756	7.73	24,810	24.96	14.13	16.0
2018-19	1,192	-32.12	15,943	-35.74	13.37	-5.4
2019-20	1,446	21.31	21,463	34.62	14.84	11.0
2020-21	1,585	9.61	23,535	9.65	14.85	0.1
2021-22	1,560	-1.58	24,932	5.94	15.97	7.5
Total	22,291		4,75,666		244.3	
	CAGR - 4%		CAGR - 8%		CAGR - 0.04%	

Source: Horticulture Department of Tamil Nadu

The analysis revealed that the total area, production, and productivity of betel leaf in Tamil Nadu showed a declining trend during the period from 2010–11 to 2021–22. Over the 12-year period, the total cultivated area decreased from 2,582 to 1,560 hectares, registering a CAGR of −4 per cent and indicating a steady contraction in cultivation. Total production also declined sharply from 64,550 to 24,932 metric tonnes, with a CAGR of −8 per cent, reflecting not only the reduction in area but also possible issues related to yield and crop health. However, productivity remained relatively stable, recording a marginal CAGR of −0.04 per cent and fluctuating between 12.18 and 28 MT/HA. A notable decline occurred in 2016–17, when production dropped by 59 per cent, likely due to adverse environmental or economic conditions. Although minor recoveries were observed in the subsequent years, the sector has not returned to its earlier performance levels. Overall, the findings indicate the need for targeted interventions in crop management, technology adoption, and policy support to revitalize production and ensure long-term sustainability.

Table 3 Area, Production and Productivity Cultivation of Betel Leaf in Namakkal District in Tamil Nadu 2010-11 to 2021-22

Year	Area (in Hectares)		Production (in Metric Tonnes)		Productivity (in Metric Tonnes /Hectares)	
	Tamil Nadu	Namakkal	Tamil Nadu	Namakkal	Tamil Nadu	Namakkal
2010-11	2,582 (100)	317 (12.3)	64,550 (100)	7,925 (12.3)	25 (100)	25 (100)
2011-12	2,374 (100)	341 (14.4)	59,350 (100)	8,525 (14.4)	25 (100)	25 (100)
2012-13	2,474 (100)	394 (15.9)	61,850 (100)	9,850 (15.9)	25 (100)	25 (100)
2013-14	2,135 (100)	393 (18.4)	59,780 (100)	11,004 (18.4)	28 (100)	28 (100)
2014-15	1,826 (100)	302 (16.5)	51,130 (100)	8,456 (16.5)	28 (100)	28 (100)
2015-16	1,731 (100)	302 (17.4)	48,468 (100)	8,456 (17.4)	28 (100)	28 (100)
2016-17	1,630 (100)	305 (18.7)	19,855 (100)	4,819 (24.3)	12 (100)	16 (129.7)
2017-18	1,756 (100)	285 (16.2)	24,810 (100)	4,831 (19.5)	14 (100)	17 (120)
2018-19	1,192 (100)	300 (25.2)	15,943 (100)	5,085 (31.9)	13 (100)	17 (126.8)
2019-20	1,446 (100)	249 (17.2)	21,463 (100)	4,108 (19.1)	15 (100)	17 (111.2)
2020-21	1,585 (100)	272 (17.2)	23,535 (100)	4,488 (19.1)	15 (100)	17 (111.2)
2021-22	1,560 (100)	301 (19.3)	24,932 (100)	4,966 (19.9)	16 (100)	17 (103.3)
Total	22,291	3,761	4,75,666	82,513	244.3	258.2

Source: Horticulture Department of Tamil Nadu

The analysis revealed that the betel leaf cultivation trends in Tamil Nadu and Namakkal district from 2010–11 to 2021–22 showed notable contrasts in area, production, and productivity. Over the years, Namakkal consistently increased its share in the state total, with its proportion of cultivated area rising from 12.3 per cent to 19.3 per cent and production from 12.3 per cent to 19.9 per cent, despite the overall decline in Tamil Nadu's cultivation and output. The state witnessed a sharp fall in total area and production, particularly in 2016–17, whereas Namakkal's share remained stable or improved, indicating greater resilience. Productivity in Tamil Nadu fluctuated and declined markedly in 2016–17, while Namakkal's productivity consistently remained higher than the state average, peaking at 129.7 per cent of the state level in 2016–17. Overall, the findings indicate that Namakkal has emerged as a key productivity hub, possibly due to better cultivation practices, input use, or institutional support, and it holds significant potential as a model region for improving betel leaf performance across Tamil Nadu.

Table 4 Top Ten District – Wise Betel Leaf Area in Tamil Nadu during the year 2021-2022

S. No.	Districts	Area (In Hectare)	Rank
1	Namakkal	301	1
2	Karur	238	2
3	Thanjavur	146.35	3
4	Dharmapuri	127	4
5	Thirichirappalli	108	5
6	Madurai	94	6
7	Theni	78	7
8	Krishnagiri	71	8
9	Salem	54.84	9
10	Kallakurichi	54	10
11	Other Districts	288.57	11
	Total	1,560.76	

Source: Horticulture Department of Tamil Nadu

The analysis revealed that the district-wise distribution of cultivated area for betel leaf in Tamil Nadu, totaling 1,560.76 hectares, is highly concentrated in a few districts. Namakkal ranks first with 301 hectares, accounting for nearly 19 per cent of the total area, highlighting its dominance in cultivation. Karur and Thanjavur follow with 238 and 146.35 hectares, respectively. Collectively, the top five districts Namakkal, Karur, Thanjavur, Dharmapuri, and Tiruchirappalli contribute more than 58 per cent of the state's total cultivated area, indicating strong regional concentration in central Tamil Nadu. In contrast, the "Other Districts" category accounts for 288.57 hectares, showing that betel leaf cultivation is spread across the state, though at smaller scales in many districts. This pattern may be attributed to favorable agro-climatic conditions, better infrastructure, or farmer preference in the leading districts. Overall, the findings emphasize the key role of top-performing districts and highlight the need for targeted support and interventions to expand area and improve productivity in underrepresented regions.

Table 5 Top Ten District –Wise Betel Leaf Production in Tamil Nadu during the year 2021-2022

S. No.	Districts	Production (In Metric Tonnes)	Rank
1	Namakkal	4,966.50	1
2	Karur	3,379.60	2
3	Dharmapuri	2,263.20	3
4	Thanjavur	2,304.76	4
5	Thirichirappalli	2,008.80	5
6	Madurai	1,183.46	6
7	Theni	1,154.40	7
8	Salem	998.09	8
9	Kallakurichi	880.20	9
10	Thoothukudi	869.40	10
11	Other Districts	4,924.11	11
	Total	24,932.52	

Source: Horticulture Department of Tamil Nadu

The analysis revealed that the district-wise production of betel leaf in Tamil Nadu, totaling 24,932.52 metric tonnes, is concentrated in a few leading districts. Namakkal ranks first with 4,966.50 MT, contributing nearly 20 per cent of the state's total production and reaffirming its leadership in both area and output. Karur follows with 3,379.60 MT, while Dharmapuri, Thanjavur, and Tiruchirappalli complete the top five districts. Together, these districts account for more than 58 per cent of total production, indicating strong regional concentration. Thoothukudi, though not among the top districts in cultivated area, appears in the top ten for production, suggesting relatively higher productivity. The "Other Districts" category

contributes 4,924.11 MT, reflecting the widespread but less intensive cultivation across the state. Overall, the findings highlight the dominant role of top-performing districts and suggest that improving productivity in lower-ranked districts could significantly enhance the state's overall output.

Table 6 Top Ten District –Wise Betel Leaf Productivity in Tamil Nadu during the year 2021-2022

S. No.	Districts	Productivity (In MT / Hectares)	Rank
1	Thoothukudi	18.90	1
2	Dharmapuri	18.60	2
3	Thirichirappalli	18.60	3
4	Salem	18.20	4
5	Namakkal	16.50	5
6	Kallakurichi	16.30	6
7	Thanjavur	15.75	7
8	Theni	14.80	8
9	Karur	14.20	9
10	Madurai	12.59	10
11	Other Districts	16.37	11
	Total	180.81	

Source: Horticulture Department of Tamil Nadu

The analysis revealed that Table 6 ranks Tamil Nadu districts based on betel leaf productivity (MT/hectare) and shows clear regional variation in efficiency. Thoothukudi leads with the highest productivity of 18.90 MT/ha, despite not ranking among the top districts in cultivated area, indicating highly efficient cultivation practices. Dharmapuri and Tiruchirappalli follow closely with 18.60 MT/ha each, while Salem also records strong performance at 18.20 MT/ha. These figures highlight districts that are able to maximize output irrespective of land constraints. Namakkal, which ranks first in both area and total production, maintains a commendable productivity of 16.50 MT/ha, placing fourth and demonstrating a strong balance between scale and efficiency. Karur, although second in area and production, records comparatively lower productivity at 14.20 MT/ha. The absence of a specific productivity value for the "Other Districts" category limits a comprehensive comparative assessment. Overall, the findings indicate significant regional differences in productivity and suggest that the diffusion of best practices from high-performing districts could enhance yields in less efficient regions.

VIII. CONCLUSION

The cultivation of betel leaf (Piper betle L.) holds considerable cultural, economic, and medicinal value in India, particularly in Tamil Nadu. This study has revealed significant insights into the trends, regional dynamics, and productivity patterns of betel leaf cultivation over the period from 2010–11 to 2021–22. While overall cultivation area and production in Tamil Nadu have shown a declining trend with compound annual growth rates of - 4 per cent and - 8 per cent respectively productivity has remained relatively stable, though with notable year-to-year fluctuations.

Namakkal district has emerged as a consistent leader in betel leaf cultivation, showing resilience amid state wide declines. It has steadily increased its share of the total cultivated area and production, and it ranks high in productivity, demonstrating an efficient and sustainable model for betel leaf farming. The district's performance underlines the importance of favorable agronomic practices, market access, and potentially better institutional support.

Other districts such as Karur, Thanjavur, Dharmapuri, and Tiruchirappalli also contribute significantly to the state's betel leaf sector, both in terms of area and output. Districts like Thoothukudi and Salem, despite having smaller cultivated areas, stand out with high productivity, indicating opportunities for efficient, high-yield farming even in land-constrained settings.

The data suggests a strong case for regional knowledge-sharing and targeted policy interventions. By replicating successful practices from high-performing districts in underperforming areas, Tamil Nadu can potentially revive and expand its betel leaf sector. Furthermore, improvements in pre- and post-harvest handling, market linkages, and access to quality inputs could enhance both domestic viability and export potential.

In conclusion, while the state faces challenges in sustaining betel leaf cultivation, there is clear potential for revitalization through strategic investments in technology, extension services, and institutional support especially by leveraging the experience of successful districts like Namakkal.

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