

Growth Dynamics of Black Pepper Cultivation in Idukki District, Kerala: Trends in Area, Production and Productivity

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Abstract: Black pepper (*Piper nigrum L.*) is an important commercial spice crop in Kerala, with Idukki District being the leading producer. The trends and growth of pepper farming in Idukki with reference to area, production and productivity during 2014–15 to 2020–21, using secondary data from the Department of Economics and Statistics, Government of Kerala. CAGR, annual growth rate, descriptive statistics and trend analysis are employed. The findings reveal a decline in area, manufacture and output, with production declining more sharply than cultivated area. The study highlights the need for better farming practices, disease management, climate-resilient technologies, quality planting materials and effective extension and marketing support to enhance pepper manufacture and yield in Idukki District.

Keywords: Black Pepper, Pepper Production, Idukki District, Area, Productivity, Growth Rate, CAGR, Kerala

Introduction

Kerala is a major spice-producing state, with black pepper (*Piper nigrum L.*) playing an important role in its agricultural economy. Idukki is the leading pepper-growing district, accounting for about 51% of Kerala's pepper cultivation area in 2014–15. The district's favourable agro-climatic conditions support extensive pepper cultivation, mainly in homesteads and plantations. However, fluctuations in area, manufacture and yield due to climate, pests, diseases, labour, input costs and market conditions have affected the sector. Therefore, analysing the trends and growth of pepper cultivation in Idukki is developing appropriate policy measures.

Review of Literature of the Study

Hema, Kumar and Singh (2007) examined the profitability pepper farming in India, with particular attention to the major producing regions of Kerala. The study highlighted the adverse effects of declining prices, increasing input costs and fluctuations in productivity on farmers' profitability. The authors emphasised the need to improve productivity and reduce production risks to sustain pepper cultivation.

Rejula, Lijo and Rajeev (2018) studied the production system and technology adoption among black pepper farmers in Kerala. The study reported that declining yields were associated with senile plantations, low input use, pest and disease incidence and changing rainfall patterns. It also found limited implementation of enhanced planting materials and irrigation practices, highlighting the standing of technological interventions for improving productivity.

Department of Economics and Statistics, Government of Kerala provides district-wise statistics on the area, production and productivity of black pepper. The statistics indicate that Idukki has emerged as the leading pepper-producing district in Kerala, followed by Wayanad. The data also demonstrate considerable fluctuations in pepper making and yield over time.

Paul (2023) analysed the area, creation, yield and export performance of black pepper, reference to Kerala. The study found that Kerala's pepper production and yield showed improvement during the recent period, although production continued to fluctuate. The research also highlighted the position of productivity improvement for strengthening Kerala's position in the pepper sector.

Research Gap Identified for the study

Existing research have inspected black pepper production, profitability, technology adoption and productivity in Kerala. However, inadequate research focus exactly on the trends and growth of pepper farming in Idukki District. Therefore, this study analyses the changes in area, production and yield of black pepper in Idukki during 2014–15 to 2020–21 using CAGR, annual growing and trend analysis. Hasan et al. (2024)

Importance of the Study

First, Idukki is the most important pepper-growing district in Kerala. In 2020–21, Idukki had 42,090.45 hectares under pepper cultivation, representing about 51.25 per cent of Kerala's total pepper area. Second, changes in pepper production have direct implications for the income and livelihood of farmers engaged in spice cultivation. Gupta and Gupta (2024) Third, the analysis of yield is particularly important because fluctuations in production cannot be explained solely by changes in cultivated area. Finally, understanding long-term trends can assist agricultural departments, farmer organisations, cooperatives and policymakers in developing appropriate strategies for strengthening pepper cultivation.

Statement of the Problem

Although Idukki occupies a dominant position in Kerala's pepper cultivation, the district has experienced fluctuations in both production and productivity. The official data reveal pepper cultivation declined from 43,852 hectares in 2014–15 to 42,090 hectares in 2020–21. More importantly, production declined from 23,916 tonnes to 18,901 tonnes during the same period. Hartono et al. (2024) Productivity declined from 545 kg per hectare to 449 kg per hectare. The present study attempts to answer this question by examining the trends and growth of area, making and yield of black pepper in Idukki District.

Objectives constructed for the study

The study has the following objectives:

1. To examine the trend of part under black pepper cultivation in Idukki District.
2. To analyse the trend of black pepper manufacture in Idukki District.
3. To examine the trend of productivity of black pepper in the district.
4. To measure the annual progress rate of area, production and productivity.
5. To estimate the Compound yearly Progress Rate of pepper cultivation.

Research Methodology

Research Design

The study follows a descriptive and analytical research design.

Data Collection

The principal source of data is the Department of Economics and Statistics, Government of Kerala, particularly *A Compendium of Agricultural Statistics Kerala 2023* and related Agricultural Statistics publications. The official compendium provides district-wise data regarding area, yield and production of pepper.

Area of the study

The geographical area selected for the study is Idukki District, Kerala.

Tools used for analysis

The study applied Percentage Growth Rate, CAGR and Linear Trend Analysis for effective result.

Trends in Pepper Farming in Idukki District

Table 1 Area, Production and Productivity of Black Pepper in Idukki District

Year	Area (Ha.)	Production (Tonnes)	Productivity (Kg./Ha.)
2014–15	43,852	23,916	545
2015–16	42,694	25,495	597
2016–17	43,790	18,726	428
2017–18	44,533	24,911	559
2018–19	43,104	23,981	556
2019–20	42,822	20,560	480
2020–21	42,090	18,901	449

Source: Compiled from Department of Economics and Statistics, Government of Kerala.

The data reveal considerable fluctuations in pepper farming in Idukki throughout the research period. The area increased to a peak of 44,533 hectares in 2017–18 before declining to 42,090 hectares in 2020–21. Production rose to 25,495 tonnes in 2015–16, fell sharply to 18,726 tonnes in 2016–17, and recovered before declining to 18,901 tonnes in 2020–21. Similarly, productivity fluctuated from 597 kg/ha in 2015–16 to 449 kg/ha in 2020–21. Overall, the declining production and output indicate the need for better farming follows and productivity-enhancing measures.

Year-to-Year Growth of Pepper Production

Table 2 Annual Percentage Growth in Area, Production and Productivity

Year	Area Growth (%)	Production Growth (%)	Productivity Growth (%)
2015–16	-2.64	06.60	09.54
2016–17	2.57	-26.55	-28.31
2017–18	1.70	33.03	30.61
2018–19	-3.21	-03.73	-00.54
2019–20	-0.65	-14.27	-13.67
2020–21	-1.71	-08.07	-06.46

Source: Compiled from Department of Economics and Statistics, Government of Kerala.

The annual growth analysis shows significant fluctuations in pepper production. Production increased by 6.60% in 2015–16, declined sharply by 26.55% in 2016–17, and recovered by 33.03% in 2017–18. However, production

declined thereafter, by 3.73% in 2018–19, 14.27% in 2019–20 and 8.07% in 2020–21. Overall, productivity fluctuated more significantly than cultivated area, indicating that productivity changes were a major factor influencing fluctuations in pepper production in Idukki District.

Table 3 CAGR of Pepper Cultivation

Variable	2014–15	2020–21	CAGR (%)
Area (Ha.)	43,852	42,090	-0.68
Production (Tonnes)	23,916	18,901	-3.85
Productivity (Kg./Ha.)	545	449	-3.18

Source: Compiled from Department of Economics and Statistics, Government of Kerala.

The CAGR analysis indicates an overall declining trend in pepper cultivation. The area under cultivation recorded a negative CAGR of 0.68%, while production and yield declined by 3.85% and 3.18%, respectively. The sharper weakening in production compared with area indicates that reduced yield was a major factor contributing to the decline in pepper production in Idukki District.

Table 4 Mean and Standard Deviation

Variable	Mean	Standard Deviation
Area (Ha.)	43,269.29	832.34
Production (Tonnes)	22,355.71	2,880.83
Productivity (Kg./Ha.)	516.29	63.74

Throughout the research period, the normal area under pepper cultivation was 43,269 hectares, with average production of 22,356 tonnes and output of 516 kg/ha. The higher variation in production and yield compared with area indicates that fluctuations in pepper production were mainly influenced by changes in productivity rather than cultivated area.

Linear Trend Analysis

Table 5 Linear Trend of Area, Production and Yield

Variable	Trend Coefficient (b)	Direction
Area	-204.14 Ha./year	Declining
Production	-702.14 Tonnes/year	Declining
Productivity	-14.07 Kg./Ha./year	Declining

The linear trend analysis shows a declining trend in area, production and productivity. The trend coefficients indicate annual declines of approximately 204 hectares in area, 702 tonnes in production and 14.07 kg/ha in productivity. These findings support the CAGR results, confirming an overall downward trend in pepper cultivation during the research period.

Discoveries of the study

The study finds that Idukki is the leading pepper-growing district in Kerala, accounting for about 51.25% of the state's pepper cultivation area in 2020–21. The cultivated area declined from 43,852 ha to 42,090 ha, while production decreased from 23,916 tonnes to 18,901 tonnes, recording a CAGR of -3.85%. Productivity also declined from 545 to 449 kg/ha. Production displayed substantial variations, with a shutdown decline of 26.55%

in 2016–17 followed by a strong recovery of 33.03% in 2017–18. Overall, the sharper decline in production compared with area highlights declining productivity as a main concern for pepper cultivation in Idukki District.

Suggestions

Founded on the results, it is suggested that pepper farmers should be providing with high-yielding and disease-resistant planting materials, along with improved practices in pruning, vine training, nutrient management and harvesting. Integrated disease management and climate-resilient practices such as mulching and soil-moisture conservation should be promoted. Agricultural extension facilities should provide regular technical training, while old and low-yielding vines should be rejuvenated. Strengthening Farmer Producer Organisations, cooperatives, value addition, market linkages and affordable institutional credit can further improve farmers' productivity, income and profitability.

Conclusion

Black pepper is a major commercial crop in Idukki and an important contributor to Kerala's spice economy. During 2014–15 to 2020–21, area, production and productivity recorded negative CAGR of -0.68%, -3.85% and -3.18%, respectively. The greater decline in production highlights productivity fluctuations as a major concern. Therefore, improved cultivation practices, disease management, climate-resilient technologies, excellence establishing materials, delay support, institutional credit and better market connections are vital for the sustainable development of pepper farming in Idukki District.

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