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# Analyzing Production, Productivity, and Export Performance of Key Spices in India

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**Abstract**

*To bolster economic growth in agriculture, there must be a concerted effort to increase production and achieve a balance in trade through exports and imports. India, in its global competition, excels in exporting significant spices and select horticultural products, thereby driving economic growth, aided by various governmental initiatives aimed at supporting farmers. This study aims to analyze the Growth Rate and Instability in Area, Production, and Productivity of major spices, as well as examine the export trends of these spices from India over a decade, from 2010 to 2020. Utilizing statistical tools such as Compound Annual Growth Rate Analysis (CAGR) and Instability Rate (IR), the study evaluates secondary data sourced from the Spice Board of India's annual reports spanning the years 2010-2011 to 2019-2020. The analysis provides insights into the compound annual growth rate and instability concerning the selected spices in terms of area, production, productivity, and export performance. Key findings shed light on India's position in the global spice market and reveal the trajectory of spice growth compared to the preceding decade (2001-2010). A critical concern for sustaining export market viability lies in enhancing productivity while maintaining product quality. Recommendations include cultivating high-quality products, stringent quality control measures, staying abreast of global market trends, implementing adequate storage protocols, ensuring proper harvesting practices, and maintaining environmental and personal hygiene. Furthermore, the study suggests introducing agricultural schemes to support spice cultivation, thereby boosting production, productivity, and ultimately impacting the Indian economy positively. These efforts aim to foster sustainable growth and competitiveness in the global spice market while ensuring the prosperity of Indian farmers and the agricultural sector.*

**Keywords: Spice Cultivation, Output, Efficiency, Export Success.**

**Introduction**

Spices, renowned for their diverse flavors and aromatic qualities, hold a revered status across culinary traditions worldwide. Despite their requirement in small quantities, spices possess distinctive properties and benefits, serving various purposes from medicinal to aromatic. The term "spice" originates from "species," reflecting the ancient classification of certain exotic foodstuffs. These plant products, ranging from seeds to leaves, bark, and roots, are coveted for their ability to enhance the taste and aroma of food, making them indispensable in the food processing industry.

India, often referred to as the "Origin and Land of Spices," stands as a beacon in spice production, unmatched by any other nation. The country's diverse agro-climatic conditions provide an ideal environment for cultivating a wide array of spices. With its moderate climate conducive to spice cultivation, India has emerged as a global leader in spice production, catering to both

domestic consumption and international demand. Spices play a pivotal role not only in flavoring foods but also in various industries such as medicine, pharmaceuticals, perfumery, and cosmetics.

The significance of spices in India’s agricultural and economic landscape cannot be overstated. India boasts the production of approximately 75 varieties of spices, with a substantial portion earmarked for export. This export prowess has earned India a distinguished position in the global spice trade, surpassing even countries that do not produce spices. Key spice-producing states such as Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, and Rajasthan contribute significantly to India’s spice production, each specializing in specific varieties. For instance, Kerala, Karnataka, and Tamil Nadu are renowned for pepper and small

cardamom, while large cardamom finds its origins in northern states like Sikkim and West Bengal. Additionally, states like Andhra Pradesh, Madhya Pradesh, Mizoram, Chhattisgarh, Uttarakhand, and Meghalaya are prominent producers of ginger, while turmeric thrives in states like Orissa, Tamil Nadu, West Bengal, Tripura, Assam, and Bihar. Cumin production flourishes in Rajasthan, Gujarat, and Uttar Pradesh.

This rich tapestry of spice cultivation across India underscores the country’s pivotal role in shaping the global spice market. With its abundant variety and unparalleled production capacity, India continues to enchant taste buds and stimulate economies worldwide, cementing its position as a powerhouse in the realm of spices.

**Table1 Categories of Spices in India**

Major Spices	Seed Spices	Tree Spices	Herbal Spices	Miscellaneous Spices
Cardamom	Coriander	Tamarind Cinnamon	Marjoram Thyme	Vanilla
Black pepper	Fenugreek	Nutmeg / Mace	Basil	Garlic
Ginger	Celery	Clove	Oregano Savoury	Saffron
Turmeric	Fennel	Tejpat	Tarragon	Juniper Berry Pepper
Chilli	Caraway Aniseed	Cam bodge	Rose Mary	Long Greater Galaga
Cumin	Dillseed	Kokum	Horse radish	Curry powder Spice Oils
	Poppy seed Mustard	Curry leaves	Hyssop	Spice Mixture
	Parsley	Cassia Asafoetida	Lovage	
	Ajwan	Pomegranate		

**Literature Review**

The literature review provides a comprehensive overview of previous studies relevant to the production, productivity, and export performance of major spices in India.

(Indhushree and Kuruvila) conducted a study on the performance of small cardamom export from India, focusing on export growth rate, instability, and geographic concentration. Their findings revealed that the post-WTO period witnessed positive growth rates and lower export instability compared to the pre-WTO period. However, challenges such as high production costs, domestic market orientation, and non-tariff barriers persist, impacting the export performance of small cardamom.

(Rao and Prasad) aimed to analyze the present state of Indian spices cultivation, production, and exports, emphasizing foreign exchange earnings.

They found that India is the largest producer and exporter of spices, cultivating approximately 75 varieties. The study highlighted the significant export contributions of India to countries such as the USA, Vietnam, China, UAE, and Malaysia, underlining the global demand for Indian spices.

(Devi and Jadav) analyzed the growth performance in the area, production, productivity, and export of spices in India over the past decade. Their study revealed positive growth rates in production and productivity, with productivity trends influencing production levels. Despite a negative growth rate in cultivation area due to agricultural diversification, the spices sector demonstrated sustainability and export potential.

(Varadharaj and Ram Prakash) explored the production trends of spices in India from 2001-02 to 2015-16, noting a positive growth trajectory. They

highlighted the dynamic nature of the Indian spices industry and its significant role in the country's economic development, driven by both domestic and international demand.

Overall, these studies provide valuable insights into the production, productivity, and export dynamics of major spices in India, highlighting key trends, challenges, and opportunities for the spice industry.

### Objectives

- Evaluate the Growth Rate and Stability in Area, Production, and Productivity of Key Spices.
- Analyze the Area, Production, and Productivity Trends of Major Spices Over a Decade.
- Examine the Export Performance of Major Spices from India Over a Ten-Year Period.

### The Scope of this Study

Encompasses the analysis of growth rates and stability in the production and productivity of significant spices in India. Additionally, the study investigates the export of spices to international markets. The analysis extends over a decade, providing insights into long-term performance trends. Data sourced from the Annual Reports and Spices Board of India are utilized for detailed analysis and examination.

### Research Methodology

This study aims to analyze data pertaining to significant spices in India, focusing on growth rates, instability in area, production, and productivity, and examining export performance. The study selects six major spice products, including Pepper, Cardamom, Chilli, Ginger, and Turmeric, using the Convenient Sampling Method (CVM).

### Data Sources

The study relies solely on secondary sources for data collection. These include publications such as Reports of the Indian Spices Board, Ministry of Commerce, Government of India, including annual reports, brochures, and websites.

**Study Period:** The research study spans a period of 10 years, from 2010 to 2020.

### Statistical Tools

#### Compound Annual Growth Rate Analysis (CAGR)

The CAGR is calculated using the formula:

$$CAGR = (y_t - y_{t-1} / y_{t-1}) \times 100$$

where  $y_t$  represents the value at the end of the period, and  $y_{t-1}$  represents the value at the beginning of the period.

#### Instability Analysis

To measure the instability of major spice area, yield, and production, the coefficient of variation (CV) is calculated using the formula:

$$CV = (\text{Standard Deviation} / \text{Mean}) \times 100$$

#### Export Performance of Indian Spices

From 2011 to 2020, India's export performance in spices has depicted a robust growth trajectory, underscoring its position as a global leader in the spice trade. Over this decade, data from the Indian Spices Board reveals a steady increase in both the volume and value of spice exports from the country. In 2011, India exported approximately 813,000 metric tons of spices, valued at USD 1.64 billion. Over the subsequent years, there was a notable uptick in export figures, with volumes reaching around 1.21 million metric tons and values surpassing USD 3.62 billion by 2020. This signifies a significant expansion of India's spice export industry, reflecting increased demand and market penetration on a global scale.

Key export destinations for Indian spices during this period included the United States, Vietnam, China, UAE, Malaysia, UK, Sri Lanka, and Indonesia, among others. These countries consistently accounted for a substantial portion of India's spice exports, demonstrating the widespread appeal and versatility of Indian spices in diverse culinary traditions worldwide.

Despite occasional challenges such as fluctuating international demand and quality standards, India's spice export industry has exhibited resilience and adaptability, contributing significantly to the country's foreign exchange earnings and economic growth. This decade-long trend underscores India's enduring prominence as a powerhouse in the global spice market.

**Table 2 Growth and Instability of Area in Hectare for Major Spices (2010-2020)**

Descriptive statistics	Cardamom	Pepper	Chilli	Ginger	Turmeric
Maximum	113593	201381	683160	859790	251824
Minimum	95930	122400	125374	678880	178470
Mean	99799.7	143583	754177	210674	221818
Standard Deviation	6889.43	26955.9	56631.5	166843	28297.3
CV	6.90326	18.7738	7.50904	79.1949	12.757
Skewness	1.743315	1.621593	3.102554	0.342916	-0.54119
Kurtosis	1.396138	1.592245	9.731449	-0.26816	-1.54154

Source: Author's calculation from Excel

The table above provides a breakdown of the descriptive statistics concerning the area of spices in India. The mean values for these variables were 99,799.7, 143,583, 754,177, 210,674, and 221,818 respectively. Notably, there is a considerable standard deviation in the area per hectare of spices,

measuring at 56,631.5. The primary aim of this study is to investigate the fluctuations in the area devoted to spice cultivation in India.

The analysis unmistakably reveals a significant advancement in production compared to the preceding decade (2001-2010).

**Table 3 Growth and Instability of Production in Tonnes for Major Spices**

Descriptive statistics	Cardamom	Pepper	Chilli	Ginger	Turmeric
Maximum	29205	70000	2411150	1845664	1398862
Minimum	18145	37000	1299191	669350	846250
Mean	22342.4	54833.3	1614235	1234924	1021742
Standard Deviation	3652.31	11208.3	318330	522570	180332
CV	16.3469	20.4406	19.7202	42.316	17.6495
Skewness	0.8606	-0.2679	1.913092	0.33159	1.353737
Kurtosis	0.012993	-1.23351	4.600719	-2.13954	0.972303

Source: Author's calculation from Excel

The table above (Table 3) presents the descriptive statistics for the area of spice cultivation in India. The mean values for these variables were 22,342.4, 54,833.3, 1,614,235, 1,234,924, and 1,021,742 respectively. Notably, there is a significant standard

deviation in the production of ginger per hectare of spices, which measures 522,570. The primary objective of this study is to examine the instability in spice production in India.

**Table 4 Growth and Instability in Productivity for Major Spices**

Descriptive statistics	Cardamom	Pepper	Chilli	Ginger	Turmeric
Maximum	0.542	0.565	2.804	234	5.555
Minimum	0.291	0.214	1.738	4.979	3.728
Mean	0.4123	0.3914	2.1428	30.6308	4.645
Standard Deviation	0.07946	0.11407	0.37958	71.4983	0.78529
CV	19.2722	29.1432	17.7141	233.42	16.9061
Skewness	0.367993	-0.01682	0.512084	3.155382	-0.23947
Kurtosis	-0.6595	-0.90263	-1.14586	9.968022	-2.12434

Source: author's calculation from Excel

The table above (Table 4) displays the descriptive statistics regarding the productivity of spices in India.

The mean values for these variables were 0.4123, 0.3914, 2.1428, 30.6308, and 4.645 respectively.

Notably, there is a considerable standard deviation in the productivity of ginger per hectare of spices, which stands at 71.4983.

The primary aim of this study is to investigate the fluctuations in the productivity of spices in India.

**Table 5 Export of Major Spices from India in Quantity (In Tonnes)**

Descriptive statistics	Cardamom	Pepper	Chilli	Ginger	Turmeric
Maximum	6440	28100	484000	50410	136000
Minimum	1950	13540	240000	15750	49250
Mean	4436.4	19594.3	358565	26412.2	96266.3
Standard Deviation	1382.25	4794.48	88449.9	10665.3	27025.4
CV	31.1571	24.4687	24.6677	40.3803	28.0736
Skewness	-0.21609	0.782274	0.082894	1.659902	0.050123
Kurtosis	-0.33653	-0.34693	-1.29456	2.217466	-0.36019

Source: Author's calculation from Excel

The table above (Table 5) presents the descriptive statistics of the export of major spices in India, measured in tonnes. The mean values for these variables were 4,436.4, 19,594.3, 358,565, 26,412.2, and 96,266.3 respectively. It's noteworthy that there

is a substantial standard deviation in the export of chili per hectare of spices, amounting to 88,449.9.

The main goal of this study is to examine the instability in the export of spices in India.

**Table 6 Export of Major Spices from India in Values (Rupees in Crores)**

Descriptive statistics	Cardamom	Pepper	Chilli	Ginger	Turmeric
Maximum	66554.75	173042	622170	44905	141616
Minimum	17679.15	38319	153554	12131	55488
Mean	42601.9	88627.4	372570	24943.8	92349.8
Standard Deviation	13635.3	39678.7	154177	9046.49	29075.3
CV	32.0063	44.7702	41.382	36.2675	31.4839
Skewness	-0.20193	0.977656	0.19047	1.106078	0.497984
Kurtosis	0.614408	1.062222	-1.10248	1.953663	-1.15713

Source: Author's calculation from Excel

The table above (Table 6) displays the descriptive statistics of the export of major spices in India, measured in rupees (in crores). The mean values for these variables were 42,601.9, 88,627.4, 372,570, 24,943.8, and 92,349.8 respectively. Notably, there is a significant standard deviation in the export of chili per hectare of spices, reaching 154,177.

The primary objective of this study is to investigate the instability in the export of major spices in India.

### Conclusion

Over the past five decades, the significance of major spices on India's spice map has witnessed notable advancements in terms of cultivation area, production output, productivity, and export

contribution to the total spice trade. While the cultivation area shares of cardamom, pepper, ginger, and turmeric have shown an increasing trend over the study period, there has been a concerning decline in the case of chili, signaling a need to address this trend to prevent further shrinkage.

The export of spices has experienced growth both in quantity and value terms. Despite setbacks in production and export observed between 2010 and 2020, possibly influenced by the globalization of agricultural trade, these issues seem to have been rectified in the subsequent period. The decreasing instability in the export of major spices suggests that India has solidified its position as a reliable supplier to the global market.

There remains ample room for India to expand its share in the world spice market by strategically channeling more spices towards international markets. This endeavor could be facilitated through the implementation of appropriate policy support at both central and state levels, thereby capitalizing on India's potential as a leading player in the global spice trade.

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