EXPORT INSTABILITY SCENARIO OF CHILLI AND CUMIN IN INDIA

Aims: To disclose the growth and instability under export values of chilli and cumin in India.

Place and duration of study: The secondary data on export pricing values obtained from the Spice Board and indiastats.com during a 30-year period (1991 to 2020).

Methodology: The growth in quantity of export of chilli and cumin was analyzed using the compound growth rate (CAGR).The Coefficient of Variation (CV), Cuddy Della Index (CDI), and Coppock's Instability Index (CII) to assess the level of export and market instability.

Results: During all three periods of study both the crops showed significant growth rates. Among the three periods, period II had comparatively higher growth rate (10.73) for chilli, while for cumin period I had higher growth rate (10.63).CV ofexport values showed period I was more stable (17.57 percent) and period II was the least stable (24.46) for chilli. While, in the case of cumin period I was highly instable (28.14 percent), followed by period II (18.8 percent) and period I (11.01 percent).

Conclusions: The export growth rate had a significant positive growth over the years and had a less variability in both export values of chilli and cumin from India.

ABSTRACT

Keywords: Compound growth rate, Cuddy Della index, Coppock's instability, Chilli, Cumin

1. INTRODUCTION

India is known as the "Spice Bowl of the World" because of its diverse and high-quality spice production. Spices not only provide flavour to food, but they also have immense therapeutic value; as a result, the worldwide food industry relies heavily on spices as a major component. In wealthy countries, health-conscious people choose natural colours and flavours derived from plants over less expensive synthetic ones.The projected increase in global demand for spices is approximately 3.19 percent, slightly above the rate of population growth (FAO, 2020) [1]. Historically, India has played an important role in the manufacture, usage, and exportation of spices. Spices account for 15.54 percent of total crop area and 11.5 percent of total crop production in India (Indiastat, 2022) [2]. The spice industry is regarded as an important part of the Indian economy. Due to their excellent aromatic features, distinct tactile characteristics, unparalleled flavour profiles, and significant therapeutic effects, Indian spices are greatly prized on a global scale. The International Organisation for Standardisation has prepared a list of around 109 spices, of which India cultivates approximately 75 and accounts for half of global spice trade. India has successfully manufactured and exported value-added spice goods over the years. Stringent quality control methods are in place, including pre-shipment inspection, validation of quality checks, and required Spices Board inspection. Physical, chemical, and microbiological parameters are strictly monitored, including pesticide residues, aflatoxins, heavy metals, and other contaminants/adulterants. The Indian spice community has evolved and matured through time as a technology-driven, quality-conscious, customer-centric, and market-driven enterprise. This transformation has resulted in a rapidly expanding range of value-added spices in bulk, crushed, cracked, blended, and dehydrated forms (curry mixes, natural food colours, spice extracts, mint oils, menthol crystals, menthol powder, and several spice-based industrial raw materials). This paper details the scenario and status of chilli and cumin export.

2. MATERIALS AND METHODS

The study relied on secondary data on export pricing values obtained from the Spice Board and indiastats.com for a period of 30years(1991 to 2020). Based on the volume of export over the last

ten years, a major minimum of two crops, namely chilli and cumin, were considered for the comprehensive investigation.

2.1 Compound Growth Rate (CAGR)

Growth rates measure how the economic variables performed in the past.The growth in quantity of export of chilli and cumin was analyzed using the compound growth rate (CAGR). CAGR was computed using log-linear model (Gujarati and Sangeetha, 2007) [3].

$$ln\, Y_t = \alpha + \beta_t + \varepsilon_t$$

Where, Y_t=export values (lakhs/ tonnes) of crop in year t, t=Time element which takes the value 1, 2 …….. n for various years, α =Intercept, β_t=Regression coefficient.

The compound growth rate (r) was computed from the following relationship

r =Anti ln of (β_t - 1) x 100

The enduring presence of stability within the agricultural spice industry plays a crucial role in bolstering the overall economic well-being of a country. The export of spices demonstrates temporal oscillations, occurring both within a specific year and throughout multiple years (Malhotra, 2015) [4]. Therefore, it is crucial to undertake a thorough examination of export volatility in order to mitigate and stabilise fluctuations. The process of measuring instability in time series data requires the formulation of clear criteria for differentiating between desirable and unwanted components. The existence of a foreseeable and consistent element does not imply instability, and so it ought to be eliminated from the dataset. The components that remain and cannot be correctly predicted are suggestive of underlying instability (Pal, 1992) [5]. This study computed the Coefficient of Variation (CV), Cuddy Della Index (CDI), and Coppock's Instability Index (CII) to assess the level of export and market instability.

2.2Coefficient of Variation (CV)

Coefficient of variation is the most widely used measure of instability that estimates the instability around the mean. The CV was worked out using the formula

$$CV = \frac{\sigma}{\bar{x}} \text{ x } 100$$

where,

σ = Standard deviation of the variable x

$\bar{x} =$ Mean of the variable x

2.3Cuddy Della Index (CDI)

Cuddy Della Instability Index (Cuddy and Della, 1978), [6]the coefficient of variation has been modified to account for the presence of trends often observed in economic time series data. This method exhibits superiority in comparison to scale dependent measurements, such as standard deviation. The Cuddy Della index (CDI) is calculated as follows:

$$\text{CDI} = \text{CV}\sqrt{1 - \bar{\text{R}}^2}$$

where,

CV = coefficient of variation

$\bar{R}^2$= adjusted coefficient of determination.

The ranges of CDI (Sihmar, 2014) [7] are given as follows:

Low instability = less than 15

Medium instability = greater than 15 to lower than 30

High instability = greater than 30

2.4Coppock’s Instability Index (CII)

The Coppock Instability Index is a more reliable measure of instability compared to the coefficient of variation due to its lack of sensitivity to trends. The statement offered introduces a metric that nearly approximates the annual percentage variation, which has been adjusted for trend, as proposed by Coppock (1962) [8]. A higher numerical value of the CII signifies a greater level of instability, whereas a lower numerical value implies fewer instability. The relative differences hold more significance in comparison to the absolute deviations. The implementation of this methodology was employed to evaluate the volatility, as it serves as a metric of variability that is not influenced by any pattern and is more suitable for conducting analyses on individual commodities.

$$CII = \text{Antilog}(\sqrt{\log V} - 1) * 100$$

$$\log V = \frac{\sum(\log X_{t+1} - \log X_t) - m)}{n}$$

where,

m = mean of the difference between logs of X_{t+1}, X_t

t = number of years

X = Value of the parameter

n =N-1

N = Number of years considered

3.RESULTS AND DISCUSSIONS

To inspect the basic behaviour of the export price value series, descriptive statistics were computed, as shown in Table 1. Inorder to have a better evaluation the whole time period was split into three partitions *i.e.,* Period – I (1991-2000), Period - II (2001-2010) and Period – III (2011-2020)and studied separately.

Table1. Descriptive statistics of export price (lakhs/tonnes)

Variable	Chilli			Cumin		
	Period I	Period II	Period III	Period I	Period II	Period III
Mean	0.34	0.48	1.09	0.55	0.92	1.47
Sd	0.06	0.12	0.22	0.15	0.17	0.16
Min	0.23	0.36	0.79	0.38	0.73	1.18
Med	0.36	0.47	1.08	0.52	0.88	1.49
Max	0.4	0.64	1.42	0.94	1.22	1.68
CV	0.18	0.24	0.2	0.28	0.19	0.11
Skewness	-0.46	0.16	0.16	1.47	0.38	-0.31
Kurtosis	-1.43	-1.85	-1.6	1.39	-1.53	-1.36

During the period I the export price values of chilli ranged from 0.23 to 0.4 with an average of 0.34, while cumin values ranged from 0.38 to 0.94, averaged to 0.55. In the second period price values of chilli exhibited a range of 0.36 to 0.64, with an average value of 0.48. Conversely, the cumin price values ranged from 0.73 to 1.22, averaged at 0.92.Over the course of period III, the chilli price values varied from 0.79 to 1.42 averaging 1.09, while cumin price varied from 1.18 to 1.68, averaging 1.47. The skewness nature of chilli states that during the first phase there were a greaternumber of negative shocks inthe price values, as the phase changes the price values overcome the situation but they remained irregular in nature. In the case of cumin, the initial phase had more positive shocks but during the later phases they got reduced and the negative shocks overtook them. The negative kurtosis values of the chilli and cumin price series suggested there were smaller number of outliers.

The growth and different instability measure calculated for the export price values of chilli and cumin are represented in Table 2. During all three periods of study both the crops showed significant growth rates. Among the three periods, period II had comparatively higher growth rate (10.73) for

chilli, while for cumin period I had higher growth rate (10.63). The growth rate of chilli and cumin maintained a growth rate during the study period, which is similar to the observations made by Chaitra and Sonnad (2019) [9].The growth in export values was mainly contributed by high productivity which was probably attributed to introduction of high yielding varieties coupled with Integrated Nutrient Management as well as due to increase in demand in world market. The Spices Board's stringent quality control methods, such as mandated sampling and analysis for the presence of aflatoxin in chilli export consignments, have made Indian chilli more acceptable in international markets. Other competitor countries' lower output also contributed to India's record result. The cumin export has been increased by 46.4% in terms of quantity between 2010 - 2019, there is huge potential to increase productivity by managing all the constraints. The findings of the study agreed with those of Yogesh and Mokshapathy (2013) [10].

Table 2.Growth and instability in export price values of chilli and cumin from India

Time Periods		Compound Growth Rate	Coefficient of Variation (%)	Cuddy Della Index	Coppock's Instability Index
		(CAGR)	(CV)	(CDI)	(CII)
Period -I (1991-2000)	Chilli	10.34*	17.57	10.87	44.40
	Cumin	10.63*	28.14	20.48	46.97
Period -II (2001-2010)	Chilli	10.73*	24.46	15.91	46.80
	Cumin	10.46*	18.80	13.16	44.26
Period -III (2011-2020)	Chilli	10.58*	19.85	11.47	44.91
	Cumin	10.19*	11.01	10.09	41.20

Note: * Indicates significance at 5 per cent level

The export instability analysis was carried out using three instability measures *viz.,* CV, CDI, and CII. When considering instability in terms of the coefficient of variation (CV) export values, period I was more stable (17.57 percent) and period II was the least stable (24.46) for chilli. While, in the case of cumin period I was highly instable (28.14 percent), followed by period II (18.8 percent) and period I (11.01 percent). The CV measure of instability could not accommodate trend present in the price series. So, Cuddy Della Index measure can be incorporated in the study. This method is superior over the scale dependent measures such as standard deviation. In case of chilli except period II other two periods falls under the low instability category. While in case of cumin period I falls under the medium instability category but period II and period III falls under low instability one.The CDI measure of instability can only quarter the linear trends. The export price series were fluctuating and there may be the presence of non-linear trends as well, Coppock's Instability Index measure can be utilised. CII values showed nearly medium instability for both the crops during all the periods under study. There was a less variability in both values of chilli and cumin exports from India hence India maintained its stability in international market.The findings of the study corresponded with those of Kumar *et al.,* (2021) [11].

4. CONCLUSIONS

The export growth rate had a significant positive growth over the years and had a less variability in both export values of chilli and cumin from India. However, still there is a huge potential to improve the export stability due to the increase in international market demands. By creating more quality assured exportable produce and utilising the price advantage in the international market we can improve the export values. Other competing countries have a greater impact on the volatility of Indian spice exports in terms of value in the worldwide market. Appropriate actions should be implemented to stabilise export earnings. It is past time for the Indian spice sector to build itself up to survive in the ever-competitive international arena in the long haul. The future of the Indian spice sector is dependent on how it capitalises on its strengths and opportunities, overcomes its weaknesses, and neutralises its threats in the next years.

REFERENCES

1.FAO.The State of Food and Agriculture 2020. 210p. 2020;Accessed 28 July 2023.Available:https://www.fao.org/3/cb1447en/cb1447en.pdf.

2.IndiaStat.IndiaStat Data Base [online]. 2021; Accessed 15 June 2023. Available: https://www.indiastat.com/table/agriculture/selected-state-wise-area-production-yield-cardamom/1418948.

3.Gujarati, D.N. and Sangeetha. Basic Econometrics. Tata McGraw Hill Publishing Company Ltd, New Delhi.2007; 182-183.

4.Malhotra, N. Sources of export instability in India. J. Int. Econ. 2015; 6(1): 58-72.

5.Pal, S. Agricultural exports of India: issues of growth and instability. Indian J. Agric. Econ.1992; 47(9): 185-194.

6.Cuddy, J. D. A. and Della, V. P. A. Measuring the instability in time series data. Oxford Bull. Econ. Statist. 1978; 40(1): 79- 85.

7.Coppock, J. D. International Economic Instability. McGraw Hill, New York, 184p; 1962.

8.Sihmar, R. Growth and instability in agricultural production in Haryana: a district level analysis. Int. J. Sci. Res. Publ. 2014;4(7): 1-12.

9.Chaitra, G.B. and Sonnad, J.S. Export performance of chilli and cumin from India: An empirical analysis. J.Pharmacognosy and Phytochemistry. 2019; 8(2): 2014-2020.

10.Yogesh, M.S. and Mokshapathy, S. Production and export performance of black pepper. Int. J. Humanities and Social Sci. Invention. 2013; 2(4): 36-44.

11.Kumar, M., Sahoo, P.K., Kushwaha, D.K., Saxena, S.N., Mani, I., Singh, G. and Pradhan, N.C. Cumin cultivation: Present status and future prospects. The Pharma Innovation J. 2021; 10: 1121-1123.