P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating (2025): 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 7; July 2025; Page No. 855-857

Received: 09-04-2025
Accepted: 11-05-2025

Indexed Journal
Peer Reviewed Journal

Growth and instability in area, production, productivity and export of guava in India

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DOI: https://www.doi.org/10.33545/26180723.2025.v8.i7l.2224

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Abstract

Guava (*Psidium guajava* L.), is an important fruit crop in the country and its global demand is increasing significantly over the past few years. The top guava producing states in India are Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Punjab, Bihar and Maharashtra. This paper highlights the growth and instability in area, production, productivity and export of guava in India. The data regarding area, production and productivity of guava in India was collected from 2004-05 to 2023-24 which includes 20 years data. The data for export quantity and value of guava from India was collected for the period from 2004-05 to 2023-24, for the purpose of comparison, the period of study was divided into different periods: Period-I: 2004-05 to 2013-14 Period-II: 2014-15 to2023-24 Overall Period: 2004-05 to 2023-24. The Compound Annual Growth Rate (CAGR) revealed that production has the highest growth rate at 6.66%, followed by area at 4.23% and productivity at 2.56% and are significant at the 1% level. During the second period of the study the CAGR observed were 23.31% for export quantity and 25.60% for value, both are statistically significant at the 1% level. The Cuddy-Della Valle Index (CDVI) of the area, production, and productivity obtained were 5.81%, 7.23%, and 7.65%, respectively and they indicate low instability. In terms of export quantity and value of guava from India, CV and CDVI values indicated high instability during the study period.

Keywords: Guava, area, production, productivity, export, compound annual growth rate, instability

1. Introduction

India's diverse climatic conditions enable the year-round cultivation of a wide range of fresh fruits and vegetables. As the leading global producer of fruits, the country is often referred as the 'fruit basket of the world.' Commonly grown fruits include mangoes, bananas, grapes, apples, oranges, apricots, guava, litchi, papaya, avocado, sapota and watermelon. According to the National Horticulture Database (2nd Advance Estimates) released by the National Horticulture Board, the fruit production and area under cultivation for the fiscal year 2024 was estimated as 112.62 million metric tons and 7.04 million hectares, respectively.

Guava (*Psidium guajava*) belonging to the myrtaceae family is believed to have originated in tropical America, possibly between Mexico and Peru, where it is found both in the wild and cultivated. The fruit has been reported in the West Indies since 1526 and was introduced to the Philippines by the Spanish and to India by the Portuguese in the early 17th century. It rapidly spread across tropical and subtropical regions and became naturalized in many countries. In some areas, guava has even become an invasive species. Guava plays a significant role in international trade due to its ease of cultivation, high nutritional value and the popularity of its processed products (Menzel,1985) [4]. Guava is often referred as a super-fruit due to the high nutritional value. It is particularly rich in vitamins A and C and its seeds contain good amounts of omega-3 and omega-6 polyunsaturated fatty acids. Besides, it is also rich in dietary fiber, riboflavin, protein and mineral salts (Kadam *et al*., 2012) [2].

Madhya Pradesh is the top producer of guava with 1,052.30 thousand tonnes representing 19.6% of the total production, followed by Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Punjab, Bihar and Maharashtra (National Horticulture Board (NHB), Ministry of Agriculture and Department of Animal Husbandry). The extensive production base presents India with enormous export prospects. India occupies a position of rank 8 as an exporting country for product Guavas, mangoes, and mangosteens with a percentage share of 2.5. Since 2013, India's guava exports have experienced a remarkable growth of 260%. The value of these exports

increased from USD 0.58 million during the period of April-January 2013-14 to USD 2.09 million in the April 2021-22 period. Major export destinations of guava from India are Nepal, United Arab Emirates, Germany, Oman, U K, U S A, Qatar and Saudi Arabia (APEDA, 2023).
The objectives of the study include to analyse the growth and instability in area, production, productivity and export of guava from India.

2. Methodology
The secondary data regarding area, production and productivity of guava in India was collected from 2004-05 to 2023-24 which includes 20 years data. The data for export quantity and value of guava (HS code: 08045010, Guavas fresh or dried) from India was collected for the period from 2004-05 to 2023-24, for the purpose of comparison, the period of study was divided into different periods: Period-I: 2004-05 to 2013-14 Period-II: 2014-15 to2023-24 Overall Period: 2004-05 to 2023-24. These data were gathered from various sources like Agricultural and Processed Food Product Export Development Authority (APEDA), Directorate General of Commercial Intelligence and Statistics (DGCIS), Indiastat.com and National Horticulture Board (NHB).

2.1 Growth rate analysis
The growth in area, production, productivity and export can be examined by using the Compound annual growth rate (CAGR). This can be done by fitting the exponential function given below:

$Y = a.b^t e_i$. (1)

Where, Y = Depended variable for which growth rate is to be estimated (Quantity exported / export value / unit value)
a = Intercept
b = Regression Coefficient
t = Time Variable.

This equation was estimated after transforming (1) as follows,

Log y = log a + t Log b. (2)

Then the percent compound growth rate (g) was computed using the relationship.

CAGR (g) = (antilog b -1) ×100. (3)

The significance of the regression coefficient was tested using the student 't' test.

2.2 Degree of instability
To study variability in area, production, productivity and export of guava an instability index was used as a measure of variability. The degree of instability in area, production, yield, export quantity and export value of guava was measured by using coefficient of variation and Cuddy-Della Valle Index.

Coefficient of variation (CV)

Coefficient of variation = $\sigma/\bar{X} \times 100$
Where, σ = Standard deviation,
$\bar{X}$ = Arithmetic mean

Cuddy-Della Valle's Instability Indices (CDVI):
The Cuddy-Della Valle Instability Index was employed to measure the instability of area, production, productivity and export data. This index is an adjusted form of the coefficient of variation (CV), specifically designed to account for trends commonly observed in economic time series data.

$$\text{Instability Index} = CV\sqrt{1 - adjR^2}$$

Where, CV = coefficient of variation
$adjR^2$ = Coefficient of determination

3. Results and Discussion
3.1 Growth and instability in area, production and productivity of guava in India
The growth in area, production and productivity of guava in India was examined by using the Compound annual growth rate (CAGR). Table 1 revealed that area, production and productivity had significant positive growth during the study period. The t-value observed were 21.27 for area, 19.21 for production, and 8.15 for productivity and it confirmed the statistical significance of these trends with consistently low p-values (0.001). The Compound Annual Growth Rate (CAGR) revealed that production has the highest growth rate at 6.66%, followed by area at 4.23% and yield at 2.57% and are significant at the 1% level. These values indicate that there is an increase in production mainly because of the expansion of cultivated area.
The fluctuations in area, production and productivity of guava in India were assessed by using two statistical tools, Coefficient of variation (CV) and Cuddy-Della Valle's (CDVI) instability index. According to the table 1, the value of coefficient of variation (CV) indicates that the production has the highest variability (36.60%) as compared to area (24.55%) and productivity (15.64%). The Cuddy-Della Valle Index (CDVI) of the area, production, and productivity have obtained 5.81, 7.23, and 7.65, and they indicate low instability, with an increase of changes in production and productivity over time. These findings aligned with the early study by Bairwa *et al*. (2012) [1].

Table 1: Growth and instability in area, production and productivity of guava in India

Particulars		Area (thousand hectares)	Production (MT)	Productivity (MT/Ha)
Growth	't' Value	21.27	19.21	8.15
	CAGR (%)	4.23***	6.66***	2.57***
	p- value	0.001	0.001	0.001
Instability	CV (%)	24.55	36.60	15.64
	CDVI (%)	5.81	7.23	7.65

Note: *** significant at 1%, ** significant at 5%, * significant at 10%, SD- Standard Deviation, CV- Coefficient of Variation, CDVI- Cuddy- Della Valle's Instability Index

3.2 Growth and instability in Export quantity and value of Guava from India

Growth in export quantity and value of guava from India was studied in three periods which include period I (2004-05 to 2013-14), period II (2014-15 to 2023-24) and overall period (2004-05 to 2023-24). Table 2 revealed that during the period I the results had shown a decreasing trend in both export quantity and value of guava from India. CAGR values recorded were -19.65% and -14.10% for export quantity and value, respectively. In contrast, Period II had shown strong positive growth in both export quantity and value. High t-values were observed for export quantity (4.763) and value (4.764). The CAGR observed were 23.31% for export quantity and 25.60% for value, both are statistically significant at the 1% level with p value of 0.001. These findings align with the earlier study by Muthulakshmi *et al.* (2022) [56666].

During the overall period the change in export quantity was marginal and there is no significant growth in quantity. Meanwhile, export value showed a moderate growth and the CAGR for value is statistically significant at 5% level. The CAGR for export quantity and value were 2.56% and 8.64% respectively. These results suggest a clear shift from declining exports in the initial period to substantial increases in both quantity and value in the later years.

The instability in the export of guava from India with regards to export quantity (MT) and export value (In lakhs) were assessed in three periods which include period I (2004-05 to 2013-14), Period II (2014-15 to 2023-24) and overall period (2004-05 to 2023-24). The table 2 indicates the instability in the export quantity and value of guava from India. Instability in terms of export quantity revealed that coefficient of variation (CV) is high, 74.42 per cent in Period I, 70.39 per cent in Period II and 75.72 per cent for the overall period. It reveals that high variability can be observed from year to year. This instability is also confirmed by the values of the Cuddy-Della Valle Index (CDVI). The most unstable period is the overall period (74.07%), followed by Period I (43.65%) and Period II (37.05%). The findings indicate that Indian guava exports are highly unstable and this could be because of unpredictable global demand, fluctuations in prices, logistical restrictions and changes in policy. In terms of export value, During Period I, the Coefficient of Variation (CV) observed was 64.29 percent and a Cuddy-Della Valle Index (CDVI) of 48.19%, indicating moderate variation. The period II had shown high volatility confirmed by high CV (84.64%) and CDVI (49.72%). During the overall period of the study, recorded a CV of 104.76 per cent and a CDVI of 87.08, which confirmed a high level of instability in the export value. These findings aligned with the early study by Kadu *et al.* (2021) [3].

Table 2: Growth and instability in Export quantity and value of Guava from India

Particulars		Period I		Period II		Overall Period	
		Qty (MT)	Value (Rs. lakhs)	Qty (MT)	Value (Rs. Lakhs)	Qty (MT)	Value (Rs. Lakhs)
Growth	't' value	-2.915	-1.746	4.763	4.764	0.771	2.504
	CAGR	-19.6473	-14.09	23.31***	25.60***	2.56	8.642**
	p-value	0.019	0.119	0.001	0.001	0.45	0.022
Instability	CV (%)	74.42	64.29	70.39	84.64	75.72	104.76
	CDVI (%)	43.65	48.19	37.05	49.72	74.07	87.08

Note: *** significant at 1%, ** significant at 5%, * significant at 10%, SD- Standard Deviation, CV- Coefficient of Variation, CDVI- Cuddy- Della Valle Instability Index

4. Conclusion

The growth rate observed for area (4.23%), production (6.66%) and productivity (2.57%) of guava in India were positive and are statistically significant at 1% level. During the period I (2004-05 to 2013-14) the results had shown a decreasing trend in both export quantity and value of guava from India. In contrast the second period (2014-15 to 2023-24) of the study had shown positive growth rate for export quantity (23.31%) and value (25.60%) and are significant at 1% level. The instability analysis revealed that Cuddy-Della Valle Index (CDVI) for area, production and productivity have obtained 5.81%, 7.23%, and 7.65%, and they indicate low instability, with an increase of changes in production and productivity over time. The high instability was observed for export quantity and export value of guava from India. The findings indicate that Indian guava exports are highly unstable and this could be because of unpredictable global demand, fluctuations in prices, logistical restrictions and changes in policy.

5. References

1. Bairwa KC, Sharma R, Kumar T. Economics of growth and instability: Fruit crops of India. Rajasthan J Ext Educ. 2017;20(1):128-32.
2. Kadam D, Kaushik P, Kumar R. Evaluation of guava products quality. Int J Food Sci Nutr Eng. 2012;2(1):7-11.
3. Kadu A, Gaware U, Baviskar P, Parvekar K, Pusdekar M. Export performance of orange from Indian. Pharma Innov J. 2021;10(6):87-90.
4. Menzel CM. Guava: An exotic fruit with potential in Queensland. Queensl Agric J. 1985;111(2):93-8.
5. Muthulakshmi K, Thilagavathi M, Shivakumar KM, Duraisamy MR, Kavino M, Uma GM. Determination of growth and export performance of mango in India. J Exp Agric Int. 2022;44(10):163-9.
6. www. Indiastats.com
7. www.apeda.gov.in
8. www.commerce.gov.in
9. www.nhb.gov.on