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Export performance of Indian oranges with special reference to Bangladesh

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Abstract

The present study examines the export performance of Indian oranges to Bangladesh. The specific objective of the study was to analyse the growth, instability and price competitiveness of Indian orange exports to Bangladesh. Secondary data on export quantity, export value, domestic prices and international reference prices were collected during the period of 2005–06 to 2024–25. The Compound Growth Rate (CGR), Coefficient of Variation (CV), Cuddy-Della Valle Instability Index (CDVI) and Nominal Protection Coefficient (NPC) were worked out for the present study.

The results of India's orange exports to Bangladesh recorded positive growth during the study period. Export quantity increased at 5.90 per cent per annum, while export value recorded a higher growth of 9.20 per cent per annum. However, the high CV and CDVI values indicated considerable instability in both export quantity and value. The overall NPC was 1.693, indicating that domestic orange prices were generally higher than international reference prices and suggesting relatively lower price competitiveness of Indian oranges. The findings highlight the importance of improving productivity, reducing production and marketing costs, strengthening post-harvest and cold-chain facilities, and improving export infrastructure and trade facilitation to enhance the stability and competitiveness of Indian orange exports to Bangladesh.

Keywords: Compound growth rate, coefficient of variation, Cuddy-Della Valle index, nominal protection coefficient

Introduction

Orange is an important fruit crop in India and contributes to agricultural income, employment and export earnings. Favourable agro-climatic conditions, improved production practices and increasing domestic and international demand have supported the growth of orange cultivation and trade. Among the different types of oranges, Nagpur Santra is particularly well known for its quality, attractive colour and distinctive flavour and has an important place in India's orange industry. The Mrig crop, harvested during February and March, also offers export opportunities when availability in some international markets is relatively low. Maintaining fruit quality through proper grading, packaging, storage and post-harvest handling is therefore important for export trade. India has considerable potential to expand orange exports, although inadequate cold storage, inconsistent quality and limited post-harvest and processing facilities remain important challenges. Maharashtra is one of the major orange-producing states and is particularly known for Nagpur Santra, which contributes to both domestic and export markets. During 2024–25, India produced 6729.17 thousand metric tonnes of oranges from an area of 501.55 thousand hectares. Maharashtra produced 1474.85 thousand metric

tonnes from 149.35 thousand hectares, highlighting its importance in India's orange sector.

Bangladesh is the largest importer of Indian oranges and is an important market due to geographical proximity, established trade relations and land-border connectivity. During 2005–06 to 2024–25, Bangladesh remained the leading destination for Indian orange exports. In 2024–25, India exported 50687.13 MT of oranges, of which 35481.73 MT was exported to Bangladesh. The total export value was US\$ 17.84 million, while exports to Bangladesh accounted for US\$ 11.62 million. Therefore, the present study focuses on the export performance of Indian oranges to Bangladesh during 2005–06 to 2024–25 using Compound Growth Rate (CGR), Coefficient of Variation (CV), Cuddy-Della Valle Index (CDVI) and Nominal Protection Coefficient (NPC).

Objective

1. To assess the export performance of Indian orange export to Bangladesh
2. To analyse the export competitiveness of orange in India

Materials and Methods

The study is based on secondary data collected from various

sources. Data on orange export quantity, export value, import quantity, import value and related trade information for India and Bangladesh were collected from the Agricultural and Processed Food Products Export Development Authority (APEDA), Directorate General of Commercial Intelligence and Statistics (DGCI&S), and Indian stat. The study covers the period from 2005–06 to 2024–25. The collected data were used to analyse the export performance of Indian oranges to Bangladesh using Compound Growth Rate (CGR), Coefficient of Variation (CV), Cuddy-Della Valle Index (CDVI) and Nominal Protection Coefficient (NPC). Period I: 2005-06 to 2014-15, Period II: 2015-16 to 2024-25, Overall period 2005-06 to 2024-25.

Compound Growth Rate

The export performance of Indian oranges to Bangladesh was estimated by calculating the Compound Growth Rate (CGR), Coefficient of Variation (CV), Cuddy-Della Valle Index (CDVI).

The growth performance of Indian orange exports to Bangladesh was estimated using the following exponential growth model.

$$Y = a \cdot b^t \quad \dots\dots\dots (1)$$

Where,

Y= Export (Quantity and Value)

a= Intercept

b= Regression Coefficient

t = Time variable

Now,

$$\log Y = \log a + \log b \quad \dots\dots\dots (2)$$

Percent compound growth rate compounded by using

$$\text{CGR}(r) = [\text{Antilog}(\log b) - 1] \times 100 \quad \dots\dots\dots (3)$$

r = Compound Growth Rate

Test of significance = student t- test

Coefficient of Variation

$$\text{Coefficient of variation (\%)} = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

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

Where,

σ = Standard deviation

$\bar{x}$ = Mean

x_i = Variable

n = Number of observation

$$\text{Standard deviation } (\sigma) = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n}}$$

Cuddy-Della Valle Index

Cuddy-Della Valle index (CDVI) is calculated by using;

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

Where,

CV = Coefficient of variation

R^2 = Coefficient of determination of the trend regression.

Nominal Protection Coefficient (NPC)

The rationale behind the computation of NPC is that it shows the divergence of domestic price from the international/border equivalent prices and there by explains the level of protection to the commodity in a country. Such divergence was mainly due to the presence of market interventions such as taxes, subsidies, and other policy instruments (Appleyard, 1987). NPC will be computed by using following equation:

$$\text{NPC}_i = \frac{P_{id} \cdot ER}{P_{ib}}$$

Where,

NPC_i = nominal protection coefficient of the i^{th} commodity

P_{id} = domestic price of the i^{th} commodity in domestic currency

P_{ib} = border price in international currency

ER = exchange rate

Results and Discussion

Over the years, India's orange exports to Bangladesh have experienced considerable changes due to variations in production, export demand, prices, transport facilities, trade policies and bilateral trade conditions. Bangladesh has remained an important destination for Indian oranges because of its geographical proximity and established trade linkages. Therefore, assessing the export performance of Indian oranges to Bangladesh is important to understand the growth and stability of exports during the study period. In this context, the present study examines the export performance of Indian oranges to Bangladesh during 2005–06 to 2024–25.

Growth performance of export of Indian orange to Bangladesh

An analysis of India's orange exports to Bangladesh provides useful insights into the export performance of oranges in terms of quantity and value. The export quantity and value of Indian oranges to Bangladesh during the study period are presented in Table 1.

Table 1: Growth performance of export of Indian orange to Bangladesh

Sr. No.	Periods	CGR (Per Cent per annum)	CV (Percent)	CDVI
Export Quantity				
1	Period I	8.23	64.29	61.53
2	Period II	-4.41	28.88	26.31
3	Overall period	5.90***	77.32	67.96
Export Value				
1	Period I	-0.17	49.87	49.86
2	Period II	4.37	69.36	68.61
3	Overall period	9.20***	96.29	77.33

Note: *** denotes significant level at 1% respectively.

Table 1 revealed that export quantity during the period I (2005–06 to 2014s–15), the export quantity recorded a positive compound growth rate (CGR) of 8.23 per cent per

annum, indicating an increase in orange exports to Bangladesh. However, the coefficient of variation (CV) was 64.29 per cent and the Cuddy-Della Valle Instability Index (CDVI) was 61.53, indicating high year-to-year fluctuations in export quantity. These fluctuations may be attributed to variations in domestic production, weather conditions, changes in demand, and trade-related factors.

During the period II (2015–16 to 2024–25), the export quantity registered a negative CGR of -4.41 per cent per annum, indicating a decline in the volume of Indian orange exports to Bangladesh. However, export instability declined considerably, as reflected by the lower CV of 28.88 per cent and CDVI of 26.31 per cent, indicating greater stability in export quantities during the later period. The decline may be attributed to changes in Bangladesh's import regulations, increased border and transportation costs, competition from other supplying countries, and disruptions in cross-border trade during the COVID-19 period (2020–21). The implementation of Bangladesh's Import Policy Order 2015–2018 in 2016 may also have influenced the flow of fresh orange exports from India.

Overall period during 2005–06 to 2024–25, export quantity recorded a significant positive growth rate of 5.90 per cent per annum at the one per cent level of significance. However, the CV (77.32%) and CDVI (67.96) remained high, indicating considerable fluctuations in export quantity over the entire study period despite the overall growth trend.

Export Value during the period I (2005–06 to 2014–15), recorded a marginal negative growth rate of -0.17 per cent per annum, indicating that export earnings remained almost stagnant. The CV of 49.87 per cent and CDVI of 49.86 indicate moderate instability in export earnings, which may be due to fluctuations in export prices and exchange rates.

During the period II (2015–16 to 2024–25), export value recorded a positive growth rate of 4.37 per cent per annum, indicating an improvement in export earnings despite the decline in export quantity. This suggests that higher export

prices, better quality produce, favourable exchange rates, or improved market prices contributed to increased export value. However, the CV (69.36%) and CDVI (68.61) indicate relatively high instability in export earnings due to price fluctuations and changing market conditions.

Overall period export value registered a significant growth rate of 9.20 per cent per annum at the one per cent level of significance, indicating a strong increase in export earnings over the study period. However, the CV of 96.29 per cent and CDVI of 77.33 indicate very high instability in export value, suggesting that export earnings fluctuated considerably due to variations in international prices, exchange rates, market demand, and trade policies.

In case of overall period export quantity and value shows the results indicate that Bangladesh remained an important market for Indian oranges during the study period. Although export quantity declined during the second period, export value continued to increase, indicating improved price realization. The significant overall growth in both export quantity and export value reflects the long-term expansion of India's orange exports to Bangladesh. However, the high CV and CDVI values suggest that exports were highly unstable, highlighting the need for stable production, improved post-harvest management, better export infrastructure, and supportive trade policies to ensure sustained export growth and reduced fluctuations.

Nominal Protection Coefficient (NPC) for Indian Oranges

The Nominal Protection Coefficient (NPC) was estimated to assess the competitiveness of Indian oranges in the international market. NPC is calculated as the ratio of domestic price to international reference price. An NPC value greater than one indicates that domestic prices exceed international prices, suggesting protection of producers and lower export competitiveness and it's presented in Table 2.

Table 2: Nominal Protection Coefficient (NPC) for Indian Oranges

Sr. No.	Period	Year	Domestic prices (Pd) (Rs/Kg)	International prices (Pr) (Rs/Kg)	NPC (Pd / Pr)
1	Period I	2005-06	10	9.56	1.046
		2006-07	11	9.68	1.136
		2007-08	12	9.31	1.289
		2008-09	14	9.16	1.528
		2009-10	15	10.13	1.481
		2010-11	20	16.43	1.217
		2011-12	22	24.98	1.13
		2012-13	25	10.49	2.383
		2013-14	28	19.68	1.423
		2014-15	31	18.54	1.672
Average (Period I)					1.43
2	Period II	2015-16	33	21.48	1.536
		2016-17	37	24.39	1.517
		2017-18	40	22	1.818
		2018-19	43	57.53	0.747
		2019-20	48	27	1.778
		2020-21	53	27.91	1.899
		2021-22	59	33.97	1.737
		2022-23	65	22.87	2.842
		2023-24	73	24.24	3.012
		2024-25	80	30.06	2.661
Average (Period II)					1.955
(Overall Period) Average					1.693

Table 2 picked that considerable variation in NPC values during the study period from 2005–06 to 2024–25. The overall average NPC was 1.693 indicating that domestic orange prices in India were, on average, 68 percent higher than international prices. This suggests that Indian oranges were generally protected from international competition and faced relatively lower price competitiveness in export markets.

During the period I, NPC values ranged from 1.046 to 2.383, with an average value of 1.431. The lowest NPC was recorded in 2005–06 (1.046), while the highest NPC of 2.383 was observed in 2012–13. Since the NPC values remained above unity throughout the period, domestic prices of oranges were consistently higher than international prices, indicating a protected domestic market. The average NPC value of 1.431 suggests that Indian oranges were moderately protected during this period, which reduced their price competitiveness in the international market.

During the period II, NPC values ranged from 0.747 to 3.012, with an average value of 1.955. The lowest NPC was recorded in 2018–19 (0.747), indicating that domestic prices were lower than international prices and Indian oranges enjoyed a comparative price advantage in export markets during that year. In contrast, the highest NPC value of 3.012 was observed in 2023–24, suggesting that domestic prices were nearly three times the international prices, thereby substantially reducing export competitiveness. The higher average NPC in Period II compared to Period I indicates increased domestic price protection and a decline in the relative competitiveness of Indian oranges in international markets.

The overall period average analysis of the Nominal Protection Coefficient (NPC) for Indian oranges during the overall period from 2005–06 to 2024–25 revealed an average NPC value of 1.693, indicating that domestic orange prices were generally higher than international prices throughout the study period. The NPC values ranged from 0.747 in 2018–19 to 3.012 in 2023–24, reflecting considerable fluctuations in the competitiveness of Indian oranges in global markets. Only 2018–19 recorded an NPC value below unity, indicating that domestic prices were lower than world prices and Indian oranges possessed a comparative export advantage during that year. In the remaining years, NPC values exceeded unity, suggesting that domestic prices were higher than international prices, thereby reducing export competitiveness. The overall average NPC of 1.693 indicates that the Indian orange sector operated under a relatively protected pricing environment. These findings imply that although Indian oranges were competitive in a few years, they were generally less competitive in international trade over the study period. Therefore, enhancing productivity, reducing production and marketing costs, improving post-harvest infrastructure, and strengthening export-oriented policies would help improve the global competitiveness of Indian oranges.

Conclusion

The study concludes that India's orange exports to Bangladesh showed an overall positive growth during 2005–06 to 2024–25, although considerable variations were observed between the two periods. Export quantity increased by 8.23 per cent per annum during Period I but declined by 4.41 per cent per annum during Period II, while the overall

export quantity recorded a significant growth of 5.90 per cent per annum. Export value showed marginal negative growth of -0.17 per cent during Period I but increased by 4.37 per cent per annum during Period II, with an overall significant growth of 9.20 per cent per annum. The higher growth in export value compared with quantity indicates improved export earnings and price realization. However, the high CV and CDVI values indicate considerable instability in both export quantity and value during the study period. The overall NPC of 1.693 indicates that domestic orange prices were generally higher than international reference prices, suggesting relatively lower price competitiveness of Indian oranges. Therefore, improving productivity, reducing production and marketing costs, strengthening grading, packaging, storage and cold-chain facilities, and improving export infrastructure and trade facilitation are important for reducing fluctuations and enhancing the stability and competitiveness of Indian orange exports to Bangladesh.

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