

A Study of Impact of Exchange Rate Volatility on Agricultural Export from India

Manasi Bhate¹, M. A. Deshmukh², M. N. Punde³, S. J. Mulay⁴, B. T. Phule⁵, V. G. Pise⁶

^{1,2,3,4,5,6}Department of MBA, MES' IMCC, Pune

¹msb.imcc@mespune.in, ²mayuridesh23@gmail.com, ³officeofmnp@gmail.com, ⁴mulayshreyas11@gmail.com, ⁵bhaktiphule01@gmail.com, ⁶pisevaishnavi24@gmail.com

<p>Peer Review Information</p> <p><i>Type: Article</i> <i>Received: 20 March 2026</i> <i>Revised: 03 April 2026</i> <i>Accepted: 21 May 2026</i> <i>Published: 03 June 2026</i></p>	<p style="text-align: center;">Abstract</p> <p>Agricultural exports are an important part of India's economy and contribute significantly to foreign exchange earnings. The study focuses on the impact of volatility of exchange rate on India's agricultural exports, with special reference to fresh fruits and specific processed food products / intermediates. The research is based on secondary data (export data and exchange rate) for the period FY 2020–21 to FY 2024–25, collected from sources such as APEDA, the Ministry of Commerce, and the Reserve Bank of India.</p> <p>The study applies trend analysis, volatility measurement, and a t-test to dive deep in the relationship between exchange rate fluctuations and export performance of subjected products. The result outcomes show that India's agricultural exports raised from USD 41.87 billion to USD 51.91 billion during the focused study period. However, exchange rate volatility created uncertainty for exporters.</p> <p>The findings also indicate that processed food exports performed more steadily than fresh fruit exports due to longer shelf life and value addition. Overall, the study suggests that a stable and moderately depreciated exchange rate can support the extensive growth of agricultural products exports from India</p> <p>Keywords: Agricultural Exports; Exchange Rate Volatility; Foreign Exchange Earnings; Fresh Fruit Exports; Processed Food Exports; Export Performance; Trade Competitiveness; Currency Fluctuations; Export Growth; Indian Agriculture.</p>
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Introduction

International trade has a crucial role in the economic development of a country. For India, there is a major contribution of agricultural exports to foreign exchange earnings and provide income opportunities for farmers, processors, and exporters. India exports a wide range of agricultural products like fruits, vegetables, cereals, spices, and processed food items to various parts of the world. Among these, fruit products and processed foods have gained increasing importance in global markets due to growing demand and improved export infrastructure.

From all factors the crucial variable that influences export performance is the USD / INR exchange rate. This exchange rate represents the value of India's currency in relation to another country's currency. Changes in exchange rates directly affect the price competitiveness of exported goods. When the domestic (Indian) currency depreciates against foreign currencies, exports may become cheaper for international buyers, which can encourage export growth. Parallely, frequent fluctuations in exchange rates create uncertainty for exporters and make it difficult to plan production, pricing, and long-term trade contracts.

Exchange rate (forex) volatility refers to the degree of variation or instability in currency values over stipulated a period of time. High volatility increases risk of financial factors for exporters as it affects profit margins, contract values, and payment settlements in trade between different nations. For agricultural exporters, this issue becomes more significant because agricultural products are often price sensitive and influenced by global market conditions. Therefore, understanding how forex turbulence affects agricultural exports is important for exporters, policymakers, and researchers.

In some previous years, India has faced noticeable fluctuations in the value of the Indian Rupee against different major international currencies such as the United State currency Dollar (USD). These fluctuations may influence the competitiveness and performance of agricultural exports in international markets. While some well-known studies suggest that currency depreciation can boost exports, others argue that excessive volatility may create uncertainty and negatively affect export growth.

Considering these aspects, the present study focuses on examining the nexus between exchange rate perturbations and agricultural exports from India to various countries. The study pretended to analyse exchange rate movements and export trends using secondary data to understand whether exchange rate fragility have a significant impact on agricultural export performance.

Literature Review

Several researchers have significantly focused and examined the co-movement between exchange rate volatility and export performance in different countries and sectors. These studies help in understanding how fluctuations in currency values influence global trade and agricultural exports. The following review presents some of important and crucial research studies those are interlinked to the present study.

Dr. Dicle Ozdemir (2017) – “Causal Relationship between Agricultural Exports and Exchange Rate: Evidence for India”

In this study, Dr. Dicle Ozdemir analysed the correspondence within agricultural exports and fluctuations in exchange rate in India. The research used long-term data from 1961 to 2013 and applied statistical methods to scrutinize the degree to which fluctuations in foreign exchange valuations serve as a determinant for agricultural export performance. The empirical evidence derived from this investigation manifests that oscillations in currency exchange parities yielded a demonstrable effect on do not have a strong or the empirical findings elucidate that oscillations in currency exchange parities exerted a statistically substantive and non-negligible influence upon the observed variables on agricultural exports. Instead, the research suggested that long-term economic growth, productivity improvements, and better infrastructure play a more important role in increasing agricultural exports. The study highlights that the investigation delineates the systemic morphological advancements and infrastructural evolutions manifested within the agrarian framework sector may contribute more to the empirical evidence suggests that export acceleration surpassed the impact of currency exchange parities movements alone.

Sidheswar Panda and Ranjan Kumar Mohanty (2015) – “Effects of Exchange Rate Volatility on Exports: Evidence from India”

Panda and Mohanty examined how the fluctuating exchange rate affects India's export performance. This particular topic and study used annual time-series data from 1970–71 to 2010–11 and applied econometric techniques such as rolling standard deviation and cointegration analysis to measure of volatility (fluctuations) in exchange rate and its dynamic impact on exports. The results showed that higher levels of exchange rate variance negatively affects India's export performance because fluctuations in currency values create uncertainty for exporters. The particular study found that world GDP positively influences export growth as well which is major consideration and outcome. The authors emphasized that maintaining a forex market stochasticity environment could help improve export performance.

Sushanta Kumar Sharma (2019) – “Exchange Rate Volatility and Exports from India: A Commodity-Level Panel Data Analysis”

Sharma undertook an empirical investigation to scrutinize the repercussions of currency parity fluctuations upon India's exports at the

commodity level. The research used monthly panel data for nearly one hundred export products from December 2012 to November 2017. Econometric models were applied to analyse both short-term and the protracted repercussions of currency parity oscillations upon export performance. The synthesized data elucidated that both the bifurcated categorization of currency valuation distinguishes between unadjusted monetary parities and those recalibrated for relative purchasing power disparities volatility negatively affect the temporal longitudinal trajectory of outbound trade commerce facilitates a state of equilibrium across an extended chronological horizon. The stochastic instability inherent in unadjusted currency parities manifested as found to have a stronger influence because it directly affects export pricing and profit margins. The investigation deduced that the systemic oscillations of currency parities instability creates uncertainty for exporters and reduces trade competitiveness.

Sugiharti (2020) – “The Impact of Exchange Rate Volatility on Indonesia’s Primary Export Commodities to the Top Five Export Destination Countries”

Sugiharti analysed the mechanism by which stochastic oscillations in currency parities catalyze shifts the export the operational efficacy and systemic output metrics of Indonesia’s primary commodities, particularly agricultural products. The study used time-series data to scrutinize the interconnectedness and reciprocal dependencies existing between currency fluctuations and export values. The synthesized data manifested that stochastic oscillations in currency parities exerted a statistically substantive deleterious influence upon the outbound commerce of fundamental raw materials. Agricultural exports were found to exhibit an acute susceptibility and heightened responsiveness toward currency fluctuations because these products are price-dependent in international markets. The study also suggested that exporters should adopt risk management strategies and diversify export markets to reduce the systemic repercussions precipitated by the pervasive unpredictability inherent in currency parity oscillations.

Okoh and Nwakwanogo (2024) – “Exchange Rate Volatility and Export of Agricultural Produce in Nigeria”

Okoh and Nwakwanogo studied obfuscate the systemic susceptibility and acute responsiveness toward agricultural exports in Nigeria. The investigation utilized a longitudinal dataset comprising discretized annual temporal increments originating from 1986 to 2021 and applied a Vector Autoregression (VAR) model to deconstruct the reciprocal dependencies inherent in currency parity stochasticity and agricultural export performance. The synthesized evidence elucidated that fluctuations in currency parities manifested can sometimes catalyze a constructivist augmentation of exports, especially when currency depreciation makes domestic products cheaper in international markets. Conversely, the investigation underscored that superfluous volatility can create uncertainty and affect long-term export stability. The investigators posited that augmenting agrarian throughput efficiency and adopting export-oriented policies can help strengthen export performance.

Gap Identification

1. Limited focus on specific agricultural export segments in India

Numerous historical inquiries have deconstructed the reciprocal dependencies between currency parity stochasticity and aggregate outbound trade efficacy. However, only few research have focused specifically on agricultural exports, especially individual categories such as fruits and processed food products. these products make up a significant proportion of India’s agricultural exports; nevertheless, these inquiries remain devoid of Studies in detail. Therefore, it is imperative to deconstruct the mechanisms by which currency parity shifts catalyze perturbations within the operational efficacy of these discrete sectoral bifurcations.

2. Need for analysis using recent exchange rate and export data

A multitude of antecedent inquiries utilized archaic datasets, potentially engendering a localized misalignment with contemporary currency parity stochasticity and the current configurations of global commercial kinetics. Therefore, exploring more recent data can provide a clearer understanding of how exchange rate volatility currently affects agricultural export performance.

3. Limited use of trend-based analysis in studying the nexus between currency parity stochasticity and outbound trade volumes.

A preponderance of antecedent scholarship has concentrated mainly on advanced econometric methods to examine the preponderance of antecedent scholarship has concentrated export performance. However, there is scope to analyses this relationship using trend analysis and secondary data to study this relationship. Understand export patterns over time.

Objectives of the Study

The primary teleological imperatives undergirding the current investigation are demarcated as follows:

1. To examine the systemic perturbations precipitated by currency parity stochasticity upon the export performance of agricultural products, particularly fruits and processed food products.
2. To scrutinize the longitudinal trajectories and structural configurations of fruit and processed alimentary exports originating from the Indian subcontinent throughout the designated temporal epoch.

3. To evaluate the stochastic oscillations of the Indian Rupee's parity relative to the US Dollar throughout the concurrent temporal continuum
4. To postulate efficacious strategic mitigations for neutralizing the systemic vulnerabilities engendered by currency parity stochasticity within the agrarian export domain.

Hypothesis

H₀: The empirical evidence fails to establish a substantive ontological nexus or a statistically significant correlation between exchange rate fluctuations and the export performance of fruits and processed food products in India.

H₁: A substantive ontological nexus exists between exchange rate fluctuations and the export performance of fruits and processed food products in India.

H₀: There is no significant difference in the export performance of fresh fruits and processed (canned) food products during the study period.

H₁: Statistical parity manifests no discernible divergence within the outbound commercial trajectories performance of fresh fruits and processed (canned) food products during the study period.

Research Methodology

Research Design

The study follows a descriptive and analytical research design. It focuses on the ontological nexus between currency parity stochasticity and the outbound commercial efficacy of agrarian commodities from India, with a focus on fresh fruits and processed food products. The descriptive aspect helps in understanding export trends and exchange rate movements during the study period, while the analytical part applies statistical tools such as volatility measurement and t-test to appraise the systemic repercussions precipitated by currency parity stochasticity upon outbound commercial efficacy.

Nature of the Study

The present study is quantitative in nature and is based completely on secondary data. It examines the ontological nexus between currency parity stochasticity and India's agricultural export performance, with special focus on fruits and processed food products.

The study is based on monthly data from April 2020 to March 2025, covering currency parity dynamics and outbound commercial valuations. Divergent analytical frameworks and econometric methodologies are deployed to discern longitudinal trajectories and deconstruct the mechanisms by which shifts in currency parities catalyze perturbations within outbound commercial efficacy.

The requisite empirical evidence was harvested from authoritative and disseminated repositories, including the Reserve Bank of India, APEDA, and the Ministry of Commerce and Industry. Given that the investigation is predicated exclusively upon secondary datasets, no nascent primary data acquisition was executed.

Tools and Techniques Used in the Study

The investigation employs rigorous quantitative methodologies to scrutinize the ontological nexus between currency parity stochasticity and the outbound commercial trajectories of agrarian commodities.

- Trend Analysis: Used to study the export trends of fruits and processed food products during the selected period.
- Volatility Measurement: The quantification of currency parity stochasticity is derived from the standard deviation of the logarithmic monthly returns pertaining to the USD/INR exchange rate.
- T-Test: Used to compare the average export performance of fresh fruits and processed food products and to check whether the difference is statistically significant.

These techniques help in understanding the longitudinal configuration of currency parity fluctuations and their subsequent systemic repercussions upon the outbound commercial trajectories of agrarian commodities throughout the 2020–2025 temporal epoch.

Scope of the Study

This investigation centers on deconstructing the mechanisms by which currency parity shifts catalyze perturbations within the outbound commercial efficacy of agrarian commodities originating from the Indian subcontinent, especially fruits and processed (canned) food items. It is completely based on secondary data collected from trustworthy sources like government reports, export data, and financial databases. The study mainly looks at the fluctuations pertaining to the valuation of the Indian Rupee relative to the U.S. Dollar, and the subsequent influence these parity shifts exert upon outbound commercial trajectories.

The research is limited to examining export data of fruits and the structural configurations and longitudinal trajectories of value-added

alimentary commodities originating from the Indian subcontinent for a specific time period. It aims to identify export trends and understand how variations in exchange rates impact export performance. The findings of the study can help exporters, policymakers, and researchers better understand the link between currency fluctuations and agricultural export performance.

Data Analysis and interpretation

India's Exports

Exports exert a pivotal influence upon, or constitute a foundational determinant within India's economic growth and help the country earn foreign exchange. India exports many types of products such as agricultural goods, processed foods, textiles, engineering products, chemicals, and services. These exports are sent to many countries including the United States, the UAE, and several European nations. Although exports sometimes face challenges like changes in global demand and fluctuations in exchange rates, they still remain a major contributor to India's international trade and overall economic development.

India's Export Growth (FY 2020–21 to FY 2024–25)

India's exports showed noticeable changes during the period from FY 2020–21 to FY 2024–25. In FY 2020–21, total exports were US\$ 493.19 billion, mainly affected by the COVID-19 pandemic and global supply disruptions. In FY 2021–22, exports recovered strongly and increased to US\$ 669.65 billion, supported by growth in engineering goods, petroleum products, and services. In FY 2022–23, exports reached a record level of US\$ 770.18 billion due to strong demand for IT services, electronics, and agricultural products. The growth slowed slightly in FY 2023–24, reaching US\$ 778.13 billion, mainly due to global economic uncertainty. However, exports improved again in FY 2024–25 and increased to US\$ 824.90 billion, with services exports and non-petroleum merchandise exports playing an important role.

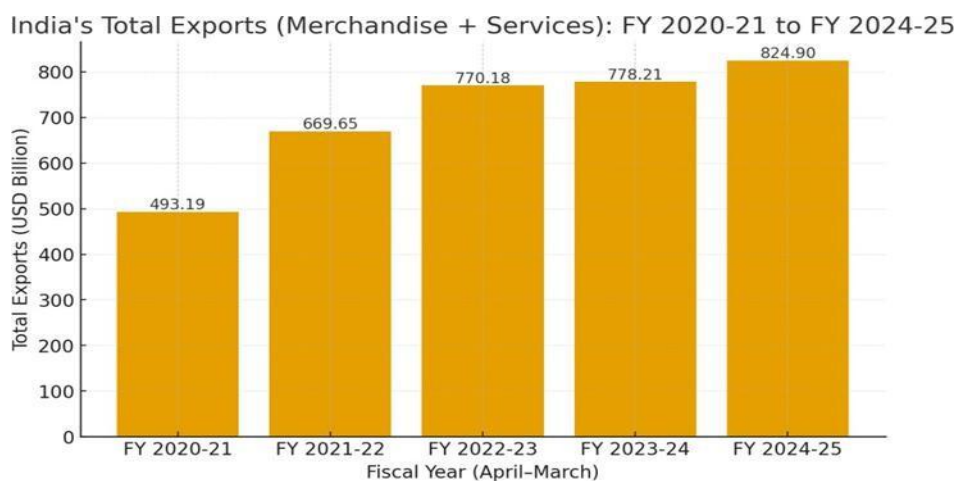


Fig. 1. India's Total Exports Growth from FY 2020–21 to FY 2024–25

Agricultural Exports

India plays a significant role as a major exporter of agricultural goods in the world. Due to its favourable climate and fertile land, the country produces a wide variety of crops such as rice, wheat, fruits, vegetables, spices, tea, and coffee. Agricultural exports contribute significantly to earning foreign exchange and supporting rural income. In recent years, India's agricultural exports have crossed US\$ 50 billion. Major export items include rice (basmati and non-basmati), marine products, spices, sugar, and fresh and processed fruits. However, agricultural exports are influenced by factors such as global prices, exchange rate changes, and government trade policies. Therefore, the agricultural sector remains an important part of India's international trade and economic growth in India.

India's Agricultural Export Trend (FY2020–21 to FY2024–25):

India's agricultural exports increased from USD 41.9 billion in FY2020–21 to USD 51.9 billion in FY2024–25. Exports grew strongly in FY2021–22 (USD 50.21 billion) and FY2022–23 (USD 53.1 billion) due to higher global demand after COVID-19 and supportive government policies. However, exports declined to USD 48.15 billion in FY2023–24 mainly because of export restrictions on products like rice and wheat. In FY2024–25, exports recovered to USD 51.91 billion, supported by better agricultural production and higher exports of fruits, vegetables, and processed foods. Overall, India's agricultural exports remained around USD 50 billion, showing moderate growth with some fluctuations.

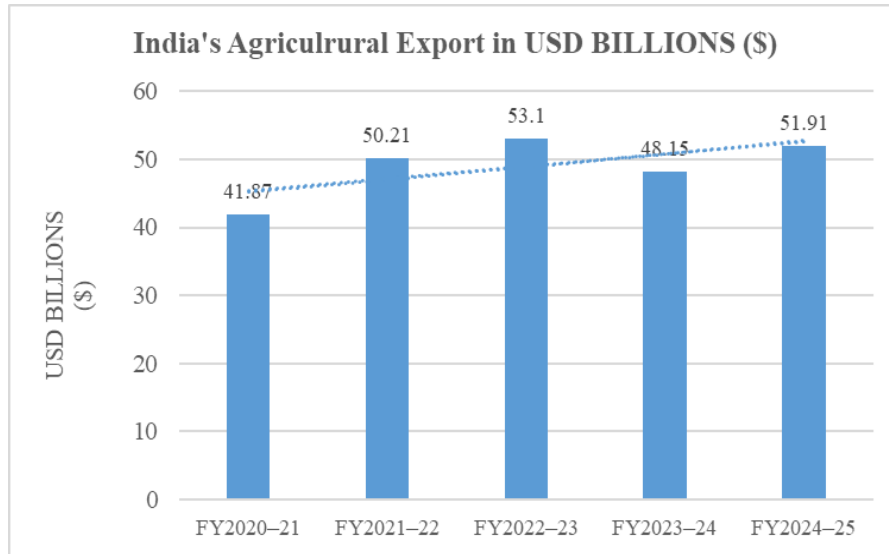


Fig. 2. Trends in India's Agricultural Exports (FY 2020-21 to FY 2024-25)

Fresh Fruits

Table 1. Export Performance of Fresh Fruits from India (2022-23 to 2024-25)

Product: Fresh Fruits						
	Value In USD Million			Qty In MT		
Product	2022-23	2023-24	2024-25	2022-23	2023-24	2024-25
Fresh Fruits	923.6	1,239.22	1,162.93	11,74,388.43	15,49,688.15	15,87,796.14

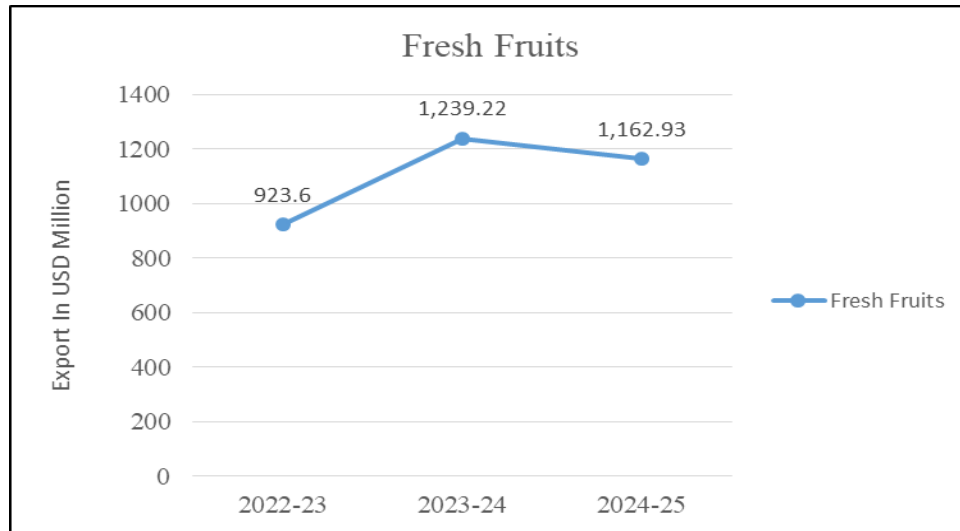


Fig. 3. Fresh Fruit Export Trends from India (2022-23 to 2024-25)

Fresh Fruits Export Trend

India's fresh fruit exports showed some fluctuations during the study period. In FY 2022-23, exports were USD 923.6 million with a quantity of 11,74,388 MT. In FY 2023-24, exports increased significantly to USD 1,239.22 million and 15,49,688 MT, mainly due to higher global demand. However, in FY 2024-25, the export value slightly decreased to USD 1,162.93 million, while the export quantity increased to 15,87,796 MT. This indicates that although the export volume grew, the average export price declined. Overall, fresh fruit exports show growth in quantity but fluctuations in value, which may be influenced by global prices and exchange rate movements.

Processed Items

Table 2. Export Performance of Processed Fruits and Vegetables from India (2022–23 to 2024–25)

Product: Processed Items						
	Value In USD Million			Qty In MT		
Fruits	2022-23	2023-24	2024-25	2022-23	2023-24	2024-25
Processed Fruits And	908.09	970.93	1,029.00	6,20,118.51	7,03,978.60	7,34,285.55
Processed Vegetables	508.96	652.42	776.83	3,66,504.24	4,45,516.83	5,50,426.88
Total	1,418.76	1,626.44	1,807.18	9,86,962.36	11,50,327.97	12,84,946.37

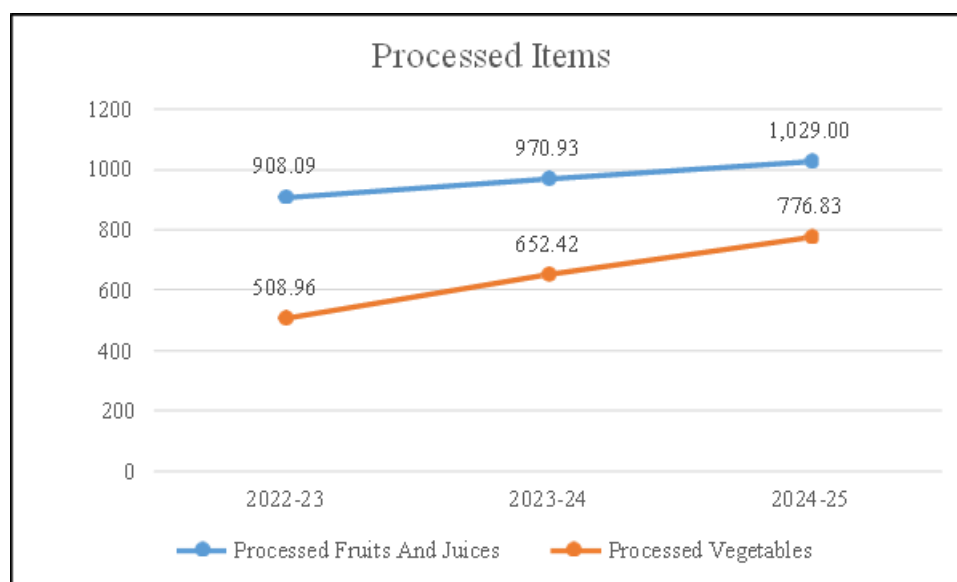


Fig.4. Export Trends of Processed Fruits and Vegetables from India (2022–23 to 2024–25)

Processed Food Export Trend

The export performance of processed food items shows a steady growth during the study period. Exports of processed fruits and juices increased from USD 908.09 million in 2022–23 to USD 970.93 million in 2023–24, and further to USD 1,029.00 million in 2024–25. Similarly, processed vegetables exports also grew from USD 508.96 million in 2022–23 to USD 652.42 million in 2023–24, reaching USD 776.83 million in 2024–25. This consistent increase indicates rising global demand and better value addition in processed food products. Overall, processed food exports show stable growth and appear less affected by price or exchange rate fluctuations compared to fresh Products price or exchange rate fluctuations compared to fresh products.

Exchange Rate Volatility

Exchange rate volatility refers to the frequent changes in the value of one currency compared to another over a period of time. Such fluctuations can affect businesses that deal with foreign currencies because they influence the value of international transactions. When exchange rates change significantly, it can impact export prices, revenues, and overall profitability. Even firms that do not directly export may still be affected, as exchange rate movements can influence competition and costs in global markets.

Table 3. Annual Exchange Rate Volatility in India (FY 2020–21 to FY 2024–25)

Year	Volatility
2020-21	0.7900
2021-22	1.0782
2022-23	1.1584
2023-24	0.4349
2024-25	0.5323

1. The systemic repercussions of currency parity stochasticity upon aggregate agrarian outbound trade efficacy.

During FY 2020–21 to FY 2024–25, the USD–INR exchange rate volatility ranged from 0.43 to 1.15. In the same period, India’s agrarian outbound trade volumes exhibited a longitudinal ascent from USD 41.87 billion to USD 51.91 billion, showing overall growth with some yearly fluctuations. Higher volatility in FY 2021–22 and FY 2022–23 coincided with a weaker rupee, which helped increase exports by making Indian products cheaper in global markets. However, very high volatility creates uncertainty in pricing and export contracts. In FY 2023–24, when volatility was lowest (0.43), export growth slowed due to global demand conditions and domestic restrictions. Overall, agricultural exports perform better when the exchange rate is relatively stable with mild depreciation.

2. Currency parity's systemic repercussions on horticultural export efficacy.

Fresh horticultural commodities—specifically mangoes, musaceous fruits, viticultural yields, and pomegranates—exhibit heightened sensitivity to currency parity stochasticity, primarily due to their inherent perishability and dependence upon expedited logistical throughput. Between FY 2022–23 and FY 2024–25, export values fluctuated between USD 923 million and USD 1,239 million. During periods of rupee depreciation, Indian fruits became cheaper internationally, increasing demand. However, frequent currency fluctuations also increase uncertainty in costs related to logistics, insurance, and contracts. Consequently, the outbound commercial trajectories of fresh horticultural commodities exhibit a heightened degree of systemic vulnerability to currency parity stochasticity relative to alternative agrarian cohorts.

3. Currency parity's systemic repercussions on value-added alimentary exports.

Processed food exports, including mango pulp, fruit juices, canned vegetables, and dehydrated foods, increased from USD 1,418.76 million in FY 2022–23 to USD 1,807.18 million in FY 2024–25. The systemic repercussions of currency parity stochasticity upon the outbound commercial trajectories of value-added alimentary commodities. A weaker rupee improved export competitiveness, while the longer shelf life and higher value addition of processed products helped exporters manage short-term currency fluctuations. However, prolonged volatility can still affect production costs and profit margins. Overall, processed food exports are less affected by exchange rate volatility compared to fresh fruits

T-Test Analysis: Comparison of Mean Exports – Fresh Fruits vs Processed Food

Hypothesis –

H₀: There is no significant difference between the export performance of fresh fruits and processed (canned) food products during the study period.

H₁: There is a significant difference between the export performance of fresh fruits and processed (canned) food products during the study period.

Table 4. Comparison of Fresh Fruit and Processed Food Exports from India (2022–23 to 2024–25)

Year	Fresh Fruits	Processed Food
2022-23	923.6	1,418.76
2023-24	1,239.22	1,626.44
2024-25	1,162.93	1,807.18

Table 5. Independent Two-Sample t-Test Comparing Fresh Fruit and Processed Food Exports

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	Variable 2
Mean	1108.583333	1617.46
Variance	27119.16623	37778.0044
Observations	3	3
Hypothesized Mean Difference	0	
df	4	
t Stat	-3.459874004	
P(T<=t) one-tail	0.012910366	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.025820733	
t Critical two-tail	2.776445105	

Interpretation of t-Test: Fresh Fruits vs Processed Items

A two-sample t-test (assuming unequal variances) was used to compare the average export values of Fresh Fruits and Processed Fruits & Juices for the period 2022–23 to 2024–25. The results show that the mean export value of Fresh Fruits was USD 1108.58 million, while Processed Fruits & Juices recorded a higher mean value of USD 1617.46 million.

The p-value (0.0258) is lower than the significance level of 0.05, and the calculated t-statistic (–3.46) is greater than the critical value (2.77). This indicates that there is a statistically significant difference between the export performance of the two product categories.

The findings suggest that processed fruit products perform better in export markets than fresh fruits. This may be because processed items have longer shelf life, better packaging, and easier storage and transportation, which makes them more suitable for international trade.

Observation

- Exchange rate volatility during the study period ranged between 0.43 and 1.15, showing moderate to high fluctuations in the USD/INR rate.
- India’s agricultural exports increased from USD 41.87 billion in FY 2020–21 to USD 51.91 billion in FY 2024–25, indicating overall growth despite currency fluctuations.
- Fresh fruit exports increased from USD 923.6 million in 2022–23 to USD 1,239.22 million in 2023–24, but slightly declined to USD 1,162.93 million in 2024–25.
- Processed food exports showed consistent growth, with processed fruits and juices rising from USD 908.09 million to USD 1,029.00 million, and processed vegetables from USD 508.96 million to USD 776.83 million.
- The t-test result (p-value 0.0258) indicates a significant difference between fresh fruit and processed product exports.

Conclusion

The study examined the impact of exchange rate volatility on India’s agricultural exports, focusing on fresh fruits and processed food products. The analysis shows that although India’s agricultural exports have grown over the years, fluctuations in the exchange rate continue to influence export performance.

A moderate depreciation of the Indian rupee helps improve export competitiveness by making Indian products cheaper in global markets. However, high and unpredictable volatility creates uncertainty for exporters in terms of pricing, contracts, and profit planning.

The study also found that fresh fruit exports are more sensitive to exchange rate changes because they are perishable and depend heavily on logistics and timely delivery. In contrast, processed food exports show greater stability and consistent growth, as these products have longer

shelf life, better storage, and higher value addition.

The t-test results confirm that processed products perform significantly better than fresh fruits in export markets. Therefore, strengthening the food processing sector and maintaining a stable exchange rate environment can help improve the overall performance of India's agricultural exports.

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