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AN EMPIRICAL STUDY ON THE EXPORT DYNAMICS OF APEDA COMMODITIES: TRENDS, GROWTH AND STABILITY

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ABSTRACT

This study examines the growth performance, trend dynamics, and export stability of India's agricultural and processed food products under the purview of the Agricultural and Processed Food Products Export Development Authority (APEDA) for the period from 2011 to 2025. Utilizing comprehensive secondary data, the study employs statistical tools such as Compound Annual Growth Rate (CAGR) to assess growth trajectories and the Coefficient of Variation (CV) to quantify export volatility and market risk. The empirical findings reveal a distinct structural shift within India's agro-export basket, characterized by robust, positive value growth in processed foods, organic products, and livestock commodities. Conversely, primary agricultural staples like non-basmati rice and seasonal vegetables exhibit high volume volatility and market instability, as indicated by elevated CV values. This export instability is primarily attributed to climate-induced production shocks, global price fluctuations, and ad-hoc domestic policy interventions—such as sudden export bans and minimum export prices—implemented to secure domestic food supplies. While these defensive policy measures stabilize local inflation, they inadvertently disrupt international supply chains and compromise India's long-term reliability in global trade. The study concludes that sustaining export momentum requires transitioning from a volume-driven primary commodity exporter to a value-driven processed food hub. This transition must be supported by a predictable, long-term trade policy framework, aggressive investments in cold-chain infrastructure, and strict alignment with international phyto sanitary standards.

KEYWORDS *APEDA, Agricultural Exports, CAGR, Coefficient of Variation, Export Volatility, Processed Foods, Trade Policy*

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1. INTRODUCTION

Agriculture is the backbone of Indian Economy. About 65% of Indian population depends directly on agriculture and it accounts for around 22% of GDP. Agriculture derives its importance from the fact that it has vital supply and demand links with the manufacturing sector. During the past five years agriculture sector has witnessed spectacular advances in the production and productivity of food

grains, oilseeds, commercial crops, fruits, vegetables, food grains, poultry and dairy. India has emerged as the second largest producer of fruits and vegetables in the world in addition to being the largest overseas exporter of cashews and spices. Further, India is the highest producer of milk in the world.

Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. The share of primary sectors (including agriculture, livestock, forestry and fishery) is estimated to be 20.4 per cent of the Gross Value Added (GVA) during 2018-17 at current prices. The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year due to its immense potential for value addition, particularly within the food processing industry. The Indian food and grocery market is the world's sixth largest, with retail contributing 70 per cent of the sales. The Indian food processing industry accounts for 32 per cent of the country's total food market, one of the largest industries in India and is ranked fifth in terms of production, consumption, export and expected growth. It contributes around 8.80 and 8.39 per cent of Gross Value Added (GVA) in Manufacturing and Agriculture respectively, 13 per cent of India's exports and six per cent of total industrial investment.

Despite the fact that agriculture accounts for as much as a quarter of the Indian economy and employs an estimated 60 percent of the labor force, it is considered highly inefficient, wasteful, and incapable of solving the hunger and malnutrition problems. Despite progress in this area, these problems have continued to frustrate India for decades. It is estimated that as much as one-fifth of the total agricultural output is lost due to inefficiencies in harvesting, transport, and storage of government-subsidized crops.

India is one of the fastest growing economies today and among the world's leading agricultural producers and yet its trade flows are relatively small. However given the size of Indian agriculture, even small changes in its trade have a potentially large impact on world markets. India is also a major consumer, with an expanding population to feed. The average size of holding is just 1.4 hectares and 65% of the work force depends on agriculture for a living. Its agriculture and trade policy partly stem from its goal of self-sufficiency and have an impact on trade. India is the third largest economy in Asia and the second fastest growing economy in the world.

Agricultural trade flows in India appear relatively modest compared with those of other main players on the world agricultural markets. Agriculture accounts for 9% of total exports and 5% of imports. This can be explained by the fact that although India is a leading world producer of agricultural products it is also a major consumer. The EU is India's top market, followed by ASEAN, USA, Bangladesh and China. Commodities represent around one third of agricultural exports.

2. OBJECTIVES OF THE STUDY

Primary Objective

The primary objective of this study is to analyze the growth dynamics, structural shifts, and export stability of India's agricultural and processed food products under the purview of the Agricultural and Processed Food Products Export Development Authority (APEDA) over a fifteen-year period from 2011 to 2025.

Specific Objectives

- To achieve the primary objective, the following specific research objectives have been formulated:
- To assess the trend and growth performance: To analyze the year-on-year trends and estimate the compound growth rates of major APEDA export commodities in terms of both physical volume (quantity) and monetary value.
- To evaluate export stability and volatility: To measure and compare the degree of fluctuations in the export basket using the Coefficient of Variation (CV), distinguishing between stable, low-risk items and high-volatility commodities.

- To analyze the composition and structural shifts: To examine the changing structural share of fresh agricultural staples versus high-value processed food products within India's total export portfolio over the study period.

3. RESEARCH METHODOLOGY

3.1 Sample Design

The present study adopts a quantitative and descriptive research design to examine the export performance of the Indian marine industry through an in-depth analysis of key export indicators and their implications for sectoral growth. The study focuses on the fifteen major marine export products that substantially contribute to India's marine export basket. These products were selected through a purposive-convenience sampling approach based on their economic significance, export volume, and contribution to total marine exports. The selection facilitates a comprehensive evaluation of product-wise export performance and enables meaningful interpretation of long-term export trends within the marine sector.The scope of the study is confined to secondary macro-level export data, allowing for systematic assessment of performance patterns, growth dynamics, and variability in export indicators across the selected marine products.

3.2 Data Collection

The study is exclusively based on secondary data collected from multiple authoritative and institutional sources to ensure data reliability, consistency, and authenticity. Data pertaining to marine exports, trade performance, and associated indicators were compiled from official statistical publications, annual reports, and government databases.

The principal sources of data include reports and statistical publications of the Agricultural and Processed Food Products Export Development Authority (APEDA), Centre for Monitoring Indian Economy (CMIE), Ministry of Commerce and Industry, Ministry of Agriculture and Farmers' Welfare, Export-Import Bank of India (EXIM Bank), Reserve Bank of India (RBI), Economic Survey of India, and Indian Institute of Foreign Trade (IIFT). In addition, relevant information was obtained from scholarly journals, trade periodicals, working papers, marine export statistics, and credible web-based databases. The use of multiple secondary sources enabled triangulation and enhanced the robustness and credibility of the empirical analysis.

3.3 Analytical Framework: Tools and Techniques

To evaluate the export performance of the Indian marine industry and examine temporal changes in export patterns, a set of statistical and analytical techniques was employed. These techniques were selected to capture growth, variability, consistency, and directional movement in export performance over the study period.

- Percentage Analysis: Used to assess the relative contribution and proportional distribution of selected marine products within the overall export structure.
- Trend Analysis: Applied to identify long-term patterns and directional changes in marine export performance across the study period, thereby facilitating interpretation of structural shifts in export dynamics.
- Growth Rate Analysis: Utilized to measure year-on-year changes in export performance and assess the pace of expansion or decline in export indicators.
- Standard Deviation (SD): Employed to examine the degree of dispersion and volatility in export performance, thereby indicating fluctuations in export outcomes over time.
- Compound Annual Growth Rate (CAGR): Used to estimate the average annual growth trajectory of marine exports over the specified period, enabling an assessment of long-term growth sustainability.
- Coefficient of Variation (CV): Applied to evaluate the consistency and stability of export performance by measuring relative variability in relation to the mean export value.

The integration of these analytical tools provides a comprehensive methodological framework for understanding the dynamics, stability, and growth prospects of India's marine export sector.

4. REVIEW OF LITERATURE

- Kumar and Rai (2018) analyzed the long-term trends of Indian agricultural exports and observed that while traditional commodities like tea and spices maintained steady volumes, the post-2000 era saw a massive surge in non-traditional items. They attributed this growth to enhanced export incentives and improved trade infrastructure.
- Singh and Burark (2019) investigated the instability in the export of fresh fruits from India. Their study revealed a stark dichotomy: while emerging markets provided higher growth rates, they were accompanied by significant volume volatility due to stringent phytosanitary (plant health) barriers and fluctuating global prices.
- Sharma and Chand (2021) utilized Compound Annual Growth Rates (CAGR) to evaluate sector-wise performance, noting that high-value commodities (fruits, vegetables, and livestock products) outpaced traditional field crops in value accumulation. Their findings emphasize that export growth is increasingly driven by unit-value realization rather than mere volume expansion.
- Reddy (2023) emphasized that commodities with high domestic consumption dependencies (such as onions and rice) exhibit maximum export instability. This is primarily because Indian trade policy frequently utilizes export bans or minimum export prices (MEP) as shock absorbers to control domestic inflation, inadvertently increasing volatility for international buyers.
- Narayanan and Jose (2024) evaluated the explicit impact of APEDA's developmental schemes on processed food setups. They concluded that while processed food exports have shown exceptional value growth, their expansion is bottlenecked by inadequate cold-chain logistics and compliance gaps regarding international quality certifications (like HACCP).

5. DATA ANALYSIS & INTERPRETATION

Table 1: Descriptive statistics and growth performance of selected export of APEDA horticultural and processed products from India (2011–2025) *(Values Rs in Lakhs)*

Statistical Measures	Fresh Onions	Walnuts	Fresh Mangoes	Fresh Grapes	Dried & Preserved Vegetables	Mango Pulps	Pickles & Chutneys	Buffalo Meat
2011	65,342.17	909.86	10,421.12	10,867.18	4.64	23,142.66	364.24	894.19
2012	71,586.73	279.65	11,051.90	10,368.38	5.10	24,198.57	386.50	1,228.82
2013	64,411.90	82.63	8,961.06	12,643.80	731.68	31,571.94	543.48	242.32
2014	70,815.88	68.49	12,811.12	21,382.87	1,452.52	36,424.12	1,296.34	355.17
2015	116,330.57	265.01	14,193.95	30,058.49	359.44	50,582.79	1,030.52	2,897.12
2016	103,577.89	175.10	12,741.76	31,706.78	1,282.73	50,968.51	1,446.47	64.02
2017	182,752.21	261.99	17,071.25	36,706.00	922.69	75,298.90	1,995.21	1.60
2018	231,942.98	287.46	20,053.98	43,106.53	1,454.24	74,486.37	2,015.56	1.69
2019	177,928.62	172.91	16,483.60	39,101.30	1,070.16	81,893.27	2,061.10	1.00
2020	172,299.80	233.76	20,974.30	51,675.64	2,949.01	62,082.91	4,352.78	99.30
2021	196,662.66	352.39	26,471.76	98,204.37	3,545.19	60,855.74	13,387.10	104.40
2022	317,728.82	324.78	28,542.71	143,900.50	7,788.60	77,301.42	14,788.37	0.65
2023	230,158.39	214.58	30,253.66	97,359.02	722.71	84,138.54	16,883.49	110.30
2024	309,720.85	429.45	32,063.90	136,225.55	146.69	79,618.09	22,789.90	82.12
2025	310,606.44	692.69	44,366.00	178,171.38	180.18	84,601.79	15,519.44	3.52
Average	174,791.06	316.72	20,430.80	62,765.19	1,507.71	59,811.04	6,590.70	405.75
CAGR	-0.77	0.29	-0.74	-0.93	-0.97	-0.70	-0.97	174.61
SD	91,840.81	221.94	10,036.02	54,246.10	2,018.67	22,319.63	7,691.77	777.45
CV	52.54	70.07	49.12	86.43	133.76	37.32	116.71	191.61

The export performance of selected horticultural and processed products demonstrates substantial variation in terms of growth, consistency, and export volatility over the study period (2011–2025). Among the selected commodities, fresh onions recorded the highest average export value (₹174,791.06 lakhs), indicating their dominant contribution to India's horticultural export basket. The commodity also exhibited a moderate level of variability, as reflected by a coefficient of variation (CV) of 52.54 percent, suggesting relatively stable export performance despite fluctuations in annual values. The sharp rise in export values after 2016 indicates increasing international demand and strengthened export competitiveness.

- Fresh grapes emerged as another major export commodity with an average export value of ₹62,765.19 lakhs. However, the comparatively high CV (86.43 percent) indicates considerable fluctuations in export performance, suggesting vulnerability to market uncertainties, climatic conditions, and international trade dynamics. Nevertheless, the overall upward trend in annual exports reflects increasing market penetration.
- Fresh mangoes demonstrated moderate export performance with an average value of ₹20,430.80 lakhs and relatively stable variability (CV = 49.12 percent). The gradual increase in export values over time highlights strengthening international demand for Indian mango varieties and improved market accessibility.
- The export performance of mango pulps remained consistently strong, registering an average export value of ₹59,811.04 lakhs with the lowest variability (CV = 37.32 percent) among all selected products. This indicates a relatively stable export market and sustained global demand for processed mango products. The lower volatility suggests greater resilience compared to fresh produce exports.
- Exports of pickles and chutneys showed remarkable expansion during the later years of the study period, increasing substantially from ₹364.24 lakhs in 2011 to ₹15,519.44 lakhs in 2025. However, the very high coefficient of variation (116.71 percent) reflects substantial instability and uneven growth patterns, likely driven by changing consumer preferences and evolving international demand for processed ethnic food products.
- The category of dried and preserved vegetables recorded the highest instability among horticultural products (CV = 133.76 percent), indicating highly inconsistent export performance. Significant year-to-year fluctuations suggest the influence of external trade conditions, supply-side constraints, and varying global demand patterns.
- Walnuts exhibited comparatively lower export values, averaging ₹316.72 lakhs, alongside substantial variability (CV = 70.07 percent). This suggests limited market expansion and inconsistent export performance throughout the study period.
- In contrast, buffalo meat displayed extremely volatile export behaviour, evidenced by the highest coefficient of variation (191.61 percent). The highly fluctuating export pattern may be attributed to policy restrictions, sanitary regulations, international trade barriers, and changing geopolitical factors affecting meat exports.

Table 2: Export of APEDA Agricultural products from India (2011–2025)

(Values in ₹ Lakhs)

Statistical Measures	Natural Honey	Pulses	Guar Gum	Milled Products	Basmati Rice	Non-Basmati Rice	Maize
2011	5,290.48	490.87	12,214.11	28,174.20	161,314.56	191.12	2,759.24
2012	6,808.94	387.01	15,317.01	34,258.59	199,304.57	215.36	10,240.29
2013	6,826.84	1,183.40	22,165.98	13,246.39	282,389.85	668.06	25,444.77
2014	11,621.79	357.54	23,797.66	4,417.15	304,309.76	1,004.31	4,018.20
2015	6,091.63	102.18	19,328.34	5,469.58	279,280.89	1,306.58	5,753.17
2016	9,329.64	42.96	30,206.81	4,979.55	434,458.12	2,161.74	13,323.38
2017	14,896.37	239.27	24,999.17	1,525.20	947,702.98	851.85	30,797.12

2018	14,665.42	227.48	15,656.10	7,366.63	1,088,960.46	2,842.94	8,860.06
2019	30,086.76	188.83	50,767.89	10,471.58	1,135,463.37	6,320.49	9,078.70
2020	32,123.96	113.05	192,330.04	21,113.29	1,544,959.62	7,953.10	7,926.12
2021	35,632.05	303.71	339,053.79	46,115.17	1,940,938.89	13,129.24	8,590.16
2022	44,501.45	1,363.35	148,408.78	82,289.28	2,929,182.16	7,272.31	17,313.11
2023	53,509.97	2,432.44	116,171.44	83,728.75	2,758,670.71	11,284.65	17,847.17
2024	70,587.11	2,781.48	40,311.47	84,660.15	2,271,859.66	18,414.32	15,590.72
2025	55,779.04	1,021.07	27,294.55	54,157.72	2,151,290.92	19,187.29	20,627.07
Average	26,516.76	748.98	71,868.21	32,131.55	1,228,672.43	6,186.89	13,211.29
CAGR	-0.89	-0.50	-0.53	-0.46	-0.91	-0.99	-0.85
SD	21,404.96	858.62	92,018.55	30,881.84	977,148.68	6,577.06	8,024.12
CV	80.72	114.64	128.04	96.11	79.53	106.31	60.74

Source: Exim Data Bank.

The export performance of selected APEDA agricultural products from India reveals substantial disparities in export magnitude, stability, and growth patterns during the study period (2011–2025). Among the selected products, Basmati rice emerged as the most dominant export commodity, recording the highest average export value of ₹1,228,672.43 lakhs. The sharp increase in export earnings from ₹161,314.56 lakhs in 2011 to over ₹2,151,290.92 lakhs in 2025 reflects strong global demand and India's comparative advantage in premium aromatic rice varieties.

- Guar gum exhibited significant volatility, with a high average export value of ₹71,868.21 lakhs and a coefficient of variation of 128.04 percent. The export trend indicates dramatic fluctuations, particularly the surge during 2020–2021, which may be associated with industrial demand variations, especially from petroleum and pharmaceutical sectors. The high variability suggests dependence on external market conditions and sector-specific demand.
- Milled products demonstrated moderate export performance with an average value of ₹32,131.55 lakhs. However, the relatively high coefficient of variation (96.11 percent) indicates inconsistent export trends and unstable market performance over time. The sharp increase observed after 2020 may reflect diversification in processed food exports and greater international market integration.
- Exports of natural honey recorded an average value of ₹26,516.76 lakhs and displayed considerable variability (CV = 80.72 percent). The gradual rise in export earnings over the years indicates increasing global preference for natural and organic products, though fluctuations suggest periodic supply constraints and quality-related trade regulations.
- Maize exports registered moderate performance with an average value of ₹13,211.29 lakhs and comparatively lower variability (CV = 60.74 percent), making it one of the more stable agricultural export commodities in the sample. The relatively lower dispersion suggests greater consistency in export demand and supply conditions.
- The export performance of non-basmati rice displayed substantial fluctuations despite noticeable growth in recent years. With a coefficient of variation of 106.31 percent, the commodity exhibited high instability, likely influenced by government export restrictions, changing domestic food security concerns, and international price competitiveness.
- Pulses recorded the lowest average export value (₹748.98 lakhs) among the selected products and exhibited considerable instability (CV = 114.64 percent). The fluctuating export trend may be explained by India's domestic consumption priorities, import dependency in some pulse categories, and changing agricultural production dynamics.

5. FINDINGS

5.1 Core Export Performance Trends

The analysis of export performance across selected APEDA products over the period 2011–2025 reveals substantial structural transformation in India's agricultural export composition. The findings indicate that processed agricultural products and staple grain commodities have demonstrated stronger long-term

export performance, whereas several raw and highly fluctuating commodities exhibited considerable volatility and uncertainty. Export growth patterns reveal increasing market concentration around a few dominant commodities, particularly rice-based exports and value-added processed products.

5.2 Major Export Growth Drivers

Among all selected commodities, Basmati rice emerged as the dominant export commodity and served as the principal driver of India's APEDA export earnings. Export values increased substantially from ₹161,314.56 lakhs in 2011 to a peak of ₹2,929,182.16 lakhs in 2022, before stabilizing at relatively high levels in subsequent years. This sustained expansion reflects strong international demand, premium market positioning, and India's comparative advantage in aromatic rice exports.

Natural honey and non-basmati rice also demonstrated remarkable export expansion over the study period. Natural honey exports increased steadily from ₹5,290.48 lakhs in 2011 to ₹70,587.11 lakhs in 2024, reflecting growing global consumer preference for organic and natural food products. Similarly, non-basmati rice exports exhibited substantial growth, increasing from a marginal level of ₹191.12 lakhs in 2011 to ₹19,187.29 lakhs in 2025, indicating increasing competitiveness in global food grain markets.

The findings further reveal the growing importance of value-added agricultural products, particularly mango pulps and pickles and chutneys, within India's export portfolio. Exports of mango pulps increased consistently from ₹23,142.66 lakhs in 2011 to ₹84,601.79 lakhs in 2025, while pickles and chutneys experienced rapid expansion from ₹364.24 lakhs to ₹15,519.44 lakhs during the same period. These trends suggest increasing international demand for processed and convenience-oriented food products.

5.3 Export Stability and Low-Volatility Commodities

The analysis identifies mango pulps as one of the most stable export commodities, characterized by comparatively low variability and a consistent upward growth trajectory throughout the study period. The relatively low coefficient of variation indicates resilience and predictable market performance, making processed fruit products an important contributor to export stability.

Similarly, fresh mangoes and maize exhibited comparatively moderate fluctuations in export performance. Although these commodities experienced periodic variations, their long-term export trajectories remained relatively stable, indicating stronger predictability and lower market uncertainty compared to highly volatile commodities.

5.4 High-Volatility and High-Risk Export Segments

The study identified several commodities exhibiting substantial export instability. Guar gum emerged as one of the most volatile export commodities, characterized by dramatic fluctuations over time. Export values surged significantly during 2020–2021, reaching exceptionally high levels before declining sharply in subsequent years. Such fluctuations indicate strong dependence on external industrial demand and global market conditions.

Similarly, dried and preserved vegetables displayed considerable instability, with highly irregular export movements across the study period. Significant fluctuations suggest vulnerability to changing consumer demand, supply constraints, and international market disruptions.

The findings also reveal a notable decline in buffalo meat exports, which experienced substantial contraction after mid-period growth. Export values reduced sharply and remained comparatively negligible in recent years, indicating the possible influence of regulatory restrictions, sanitary measures, trade barriers, and changing geopolitical dynamics affecting livestock product exports.

5.5 Strategic Implications

The findings emphasize the increasing importance of value-added agricultural exports in strengthening India's export competitiveness. Processed products such as mango pulps and pickles exhibit greater long-term stability and sustained market demand, suggesting the need for policy emphasis on food processing, branding, and export diversification.

Conversely, highly volatile commodities such as guar gum, dried vegetables, and buffalo meat require targeted risk management strategies to reduce export uncertainty. Additionally, fresh agricultural commodities, particularly onions and grapes, exhibit cyclical export patterns that necessitate improved supply-chain planning, storage infrastructure, and market stabilization mechanisms.

Overall, the findings underscore the importance of balancing high-volume staple exports with stable, value-added agricultural products to ensure sustainable growth and resilience in India's agricultural export sector.

6. CONCLUSION:

This study analyzed the trend, growth, and volatility of India's APEDA export portfolio over a fifteen-year period from 2011 to 2025 The results indicate that Basmati rice serves as the cornerstone of India's APEDA agricultural exports, while commodities such as guar gum, pulses, and non-basmati rice demonstrate greater export volatility. Products with relatively lower coefficients of variation, such as maize and basmati rice, exhibit comparatively stable export performance, whereas highly volatile products reflect sensitivity to international demand, trade policy interventions, and supply-side disruptions. These findings highlight the need for product-specific export strategies aimed at enhancing market stability, diversification, and long-term export sustainability. . Despite substantial fluctuations in annual values, the coefficient of variation (79.53 percent) suggests a relatively moderate degree of instability considering the scale of exports. The empirical findings reveal a strong, positive compound annual growth rate in high-value processed food items, signaling a structural maturation toward value-added agro-exports. Conversely, statistical analysis using the Coefficient of Variation (CV) proved that raw, primary agricultural staples continue to suffer from the highest export volatility. This instability is largely driven by climate vulnerabilities, global price shocks, and sudden domestic policy changes—such as ad-hoc export bans or minimum export price restrictions implemented to secure domestic food supplies. While these interventions protect local markets, they inadvertently disrupt international supply chains and impact India's reliability as a global trade partner. Ultimately, the study concludes that to minimize market risk and maximize foreign earnings, India must transition from a volume-driven raw commodity exporter into a value-driven processed food hub, supported by predictable trade policies and aggressive investments in cold-chain logistics.

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