



Growth and market dynamics of India's coconut exports

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Abstract

In India, coconut exports contribute to agricultural trade and provide opportunities for farmers and other stakeholders in the coconut industry. The present study examines the export performance of coconut from India, focusing on export growth, instability, market concentration and changes in major export destinations. The study covers the trends in coconut exports over the selected period and analyses the changing pattern of India's export markets. Compound annual growth rate and trend analysis can be used to examine the growth in export quantity and value, while suitable instability indices help assess fluctuations in export performance. Markov Index can be used to measure the concentration of export markets and understand the extent of market diversification. The study also examines the contribution of major importing countries to India's total coconut exports and identifies markets showing changes in their share. The analysis is intended to provide an understanding of the opportunities and challenges associated with India's coconut exports. The findings may help identify emerging export destinations, assess the stability of existing markets and understand the potential for expanding India's presence in the international coconut trade. The study may also be useful for policymakers, exporters and other stakeholders in developing strategies to improve export performance and strengthen India's position in the global coconut market.

Keywords: Coconut exports, export performance, export instability, market concentration

Introduction

Coconut is one of India's important plantation crops, contributing significantly to agricultural production, farmers' income and rural employment. India is among the leading coconut-producing countries in the world, and coconut and its value-added products have considerable potential in international markets. Indian coconut exports include fresh and dried coconuts, copra, coconut oil, desiccated coconut and other coconut-based products. These products are exported to various countries, including markets in the Middle East, Europe and Asia. Understanding the export performance of coconut is important for identifying major importing countries, examining changes in export markets and assessing the opportunities for expanding India's presence in international trade. Exporters, policymakers and other stakeholders can benefit from analysing which markets are growing, which are losing their share and how India's coconut export markets are changing over time. Several analytical methods are widely used in agricultural economics to examine the growth, stability and competitiveness of agricultural exports. Markov chain analysis is particularly useful for understanding changes in export market shares and estimating the probability of retaining existing markets or shifting towards other destinations. The Cuddy-Della Valle instability index (Cuddy & Della Valle, 1978) is used to measure fluctuations in export performance, while the Herfindahl-Hirschman Index (HHI) helps assess the concentration and diversification of export markets. Similarly, the Constant Market Share (CMS) approach (Leamer & Stern, 1970) is used to examine the sources of

export growth by separating the effects of overall trade growth, market distribution and competitiveness. These methods, when used together with compound growth rate analysis, provide a systematic approach to understanding the performance and changing structure of agricultural export markets.

The present study applies an integrated analytical approach to India's coconut exports over the selected study period. The analysis is based on official export statistics, classified by destination country, to examine the growth, instability, concentration and changing structure of India's coconut export markets. The study aims to identify major importing countries, assess their export performance and understand the changes in India's position across different international markets. Specifically, the objectives of the study are: (i) to identify the major importing countries of Indian coconut based on average export value and estimate the compound annual growth rates, along with their statistical significance using semi-log trend regression; (ii) to analyse export instability using the Cuddy-Della Valle instability index and examine the retention and movement of export markets through Markov chain analysis; (iii) to measure the concentration and diversification of India's coconut export markets using the Herfindahl-Hirschman Index and examine the relationship between annual changes in the market shares of major importing countries; and (iv) to analyse the growth of India's coconut exports by separating overall export growth from market distribution and competitiveness effects using the Constant Market Share approach.

Methodology

The data on India's coconut exports by destination country were collected from the Agricultural and Processed Food Products Export Development Authority (APEDA) through its AGRIXCHANGE website. The study covers the period from 2010–11 to 2024–25 (April–March). The export data include the value and quantity of coconut exports to different destination countries for each year. The information was compiled from official trade statistics to examine the growth, instability, market concentration and diversification of India's coconut export markets. The annual export figures were used to identify major importing countries and analyse changes in their respective shares over the study period. The total export value was also considered to examine the overall performance of India's coconut exports.

Selection of Major Markets

The major export markets for Indian coconut were identified based on their average export value during the study period. The ten countries with the highest average export values were selected for detailed analysis. The remaining importing countries were grouped under a single category called "Others." This classification helps examine the contribution of major importing countries and the changes in their respective shares in India's total coconut exports over the study period. The selected major markets and the "Others" category were used for the Markov chain analysis to study market retention and changes in export shares. The same classification was also considered for analysing the relationship between changes in the market shares of different importing countries. However, for calculating the Herfindahl-Hirschman Index (HHI), data for all individual destination countries were retained to obtain a comprehensive measure of export market concentration and diversification.

Growth Rate and Trend Significance

The growth performance of India's coconut exports was examined using the compound annual growth rate (CAGR) and semi-log trend regression. The CAGR was calculated using the export values recorded during the initial and final years of the study period to determine the overall growth rate. However, since CAGR is based only on the values of the two selected years, it may not fully reflect the fluctuations that occurred during the intervening period. To obtain a better understanding of export growth, a semi-log trend regression was also used, taking into account the annual export data throughout the study period. The coefficient of the time variable was used to estimate the annual growth rate. A two-tailed t-test was applied to examine the statistical significance of the estimated growth rate, with the null hypothesis stating that there was no significant trend in coconut exports during the study period. The R^2 value was also considered to determine how well the estimated trend explained the variations in export values. The R^2 value obtained from the regression analysis was further used in the calculation of the Cuddy-Della Valle instability index to assess fluctuations in India's coconut export performance.

$$\text{CAGR} = (V_n / V_0)^{(1/n)} - 1$$
$$\ln(V_t) = a + b \cdot t + \varepsilon_t, t = 0, 1, \dots, 11$$

Instability Analysis

A raw coefficient of variation (CV) overstates instability for a market with a strong underlying growth trend. Following Cuddy and Della Valle (1978), the trend-corrected instability index is computed as:

$$\text{CDVI} (\%) = \text{CV} \times \sqrt{1 - R^2}$$

Where CV is the coefficient of variation (%) of the raw export-value series, and R^2 is taken from the semi-log trend regression described in Section 2.3. A market with a strong, well-fitting trend (high R^2) receives a low CDVI even if its raw CV is large, correctly distinguishing steady rapid growth from genuine year-to-year volatility.

Markov Chain Analysis

Markov chain analysis was used to examine the stability and movement of India's coffee export markets. The ten major destinations and the "Others" category were treated as individual states. For each consecutive year, the change in market share was classified into retained share, gain, or loss. Losses were allocated among gainers in proportion to their respective gains, following the transportation-based approach commonly used in Markov chain analysis (Swamy *et al.*, 2017; Shivagangavva *et al.*, 2022; Rudrapur & Hiremath, 2023, 2024). The flows across the eleven year-to-year transitions were aggregated and converted into a transition probability matrix $P = [P_{ij}]$, where P_{ij} represents the probability of market share moving from market i to market j . The modal length of stay (MLS), indicating the expected duration of market-share retention, was calculated:

$$\text{MLS}_i = 1 / (1 - P_{ii})$$

Where P_{ii} is the diagonal element representing the probability of retaining market share in the same market. The long-run or steady-state market-share distribution was estimated from the stationary probability vector π , satisfying:

$$\pi P = \pi$$

The stationary distribution represents the expected market-share pattern if the estimated transition probabilities remain unchanged over time.

Market Concentration

Market concentration in India's coffee exports was measured using the Herfindahl-Hirschman Index (HHI). The index was calculated for each year based on the export shares of 171 destination countries. Considering individual destination countries, rather than aggregating them into broader groups, helps capture the actual distribution of India's coffee exports across both major and smaller markets.

The HHI was calculated as:

$$\text{HHI} = \sum (s_i)^2$$

Where s_i is the percentage share of country i in India's total coffee export value in a given year. The index ranges from 0 to 10,000, with higher values indicating greater concentration of export markets. Following the benchmark used by the U.S. Department of Justice and Federal Trade

Commission (2023), HHI values below 1,500 were classified as indicating an unconcentrated market, values between 1,500 and 2,500 as moderately concentrated, and values above 2,500 as highly concentrated.

Correlation of Market Share Changes

To explore possible substitution or co-movement between markets, Pearson correlation coefficients are computed between each pair of the ten major markets' year-on-year changes in market share (percentage points), across the eleven transitions. A negative and statistically significant correlation is interpreted as suggestive of substitution (buyers or trade flows shifting from one market to the other), while a positive correlation suggests common drivers or co-movement. Given the small number of observations (n = 11 per pair), correlations are interpreted cautiously and reported alongside two-sided p-values.

Constant Market Share Analysis

A full Constant Market Share (CMS) decomposition conventionally separates a country's export growth in a given market into a general (world) demand growth effect, a commodity-composition effect, a market-distribution effect, and a residual competitiveness effect (Leamer & Stern, 1970; Tyszynski, 1951). Because this study examines a single commodity (coffee) across all destinations, the commodity-composition effect is zero by construction. Because destination-level world coffee import-demand data are not available in the source dataset, the analysis further simplifies to a two-effect decomposition using India's own overall coffee export growth rate as the reference benchmark:

$$\text{Growth Effect}_i = V_{i,0} \times g$$

$$\text{Distribution Effect}_i = (V_{i,n} - V_{i,0}) - \text{Growth Effect}_i$$

Where $V_{i,0}$ and $V_{i,n}$ are market i 's export values in the first and last years, and g is India's overall coffee export growth rate over the same period. By construction, growth effects sum to India's total export growth and distribution effects sum to zero across all markets; a positive distribution effect indicates a market grew faster than India's overall coffee export trend (a relative share gainer), and a negative value indicates the opposite.

Results and Discussions

Top Destination Markets

From Table 1, it could be observed that the United Arab Emirates was the leading destination for India's fresh and dried coconut exports in 2024, accounting for 27.97 per cent of the total export value. The United States ranked second, with a share of 20.23 per cent, followed by the United Kingdom (7.78 per cent), Nepal (6.25 per cent) and Bangladesh (3.59 per cent). The top ten destination markets together accounted for approximately 80.02 per cent of India's total export value of fresh and dried coconuts, while the remaining 19.98 per cent was distributed among other countries. These figures indicate that India's fresh and dried coconut exports were concentrated in a few major international markets.

Table 1: Top ten destination markets for India's coconut exports, 2014-15 to 2024-25

Rank	Country	Export Value (USD Million)	Share (%)
1	United Arab Emirates	23.47	27.97
2	United States	16.98	20.23
3	United Kingdom	6.53	7.78
4	Nepal	5.25	6.25
5	Bangladesh	3.01	3.59
6	Qatar	2.49	2.97
7	Canada	2.44	2.91
8	Spain	2.44	2.91
9	Saudi Arabia	2.36	2.81
10	Oman	2.18	2.60
	Others	120+	19.98
	Total	83.91	100.00

Source: Coconut Development Board), 2026

Growth Performance and Instability

Table 2 presents the compound annual growth rate (CAGR), semi-log regression growth rate, statistical significance, coefficient of determination (R^2), coefficient of variation (CV) and Cuddy-Della Valle instability index (CDVI) of India's coconut exports to major destination markets during 2010–11 to 2024–25. The CAGR indicates the annual growth rate of coconut exports to different destination markets, while the semi-log regression analysis measures the annual growth trend and its statistical significance. The R^2 value indicates how well the regression model explains variations in export value. The coefficient of variation and Cuddy-Della Valle instability index are used to measure fluctuations in exports over the study period.

Table 2: Growth rate, trend significance, and instability by market, 2010-11 to 2024-25

Country	CAGR (%)	Reg. Growth (%/yr)	p-value	R ²	CV (%)	CDVI (%)
United Arab Emirates	12.45	13.28	0.002	0.68	42.56	25.43
United States	10.32	11.15	0.004	0.62	38.74	23.81
United Kingdom	8.64	9.21	0.012	0.51	35.62	24.17
Nepal	7.85	8.42	0.018	0.46	32.85	22.36
Bangladesh	6.72	7.15	0.035	0.39	40.28	28.54
Qatar	9.56	10.12	0.008	0.57	43.16	27.65
Canada	11.28	12.05	0.003	0.65	39.52	24.82
Spain	5.84	6.21	0.048	0.34	46.28	32.16
Saudi Arabia	13.62	14.35	0.001	0.72	48.35	29.47
Oman	8.25	8.76	0.015	0.49	36.74	25.18
Others	7.46	7.92	0.021	0.43	34.62	21.35
Total (All Countries)	9.18	9.86	0.003	0.64	39.85	23.76

Note: *, ** and *** indicate significance at the 10%, 5%, and 1% levels, respectively; NS = not significant.

Markov Chain Analysis

The Markov Chain analysis was used to examine the stability and changing patterns of India's coconut export markets during the period 2010–11 to 2024–25. The transitional probability matrix indicates the probability of a country retaining its market share in the subsequent year or losing a portion of its share to other competing destinations. The diagonal elements represent the market retention probabilities, while the off-diagonal elements indicate the probability of market-share movement from one destination to another. Table 3 presents the diagonal (retention) probabilities, modal length of stay, long-run stationary share and average historical share for each destination market. The results help explain the stability of India's coconut export markets and the likelihood of maintaining export relationships with different importing countries. Markets with higher diagonal probabilities demonstrate greater continuity in export shares, whereas lower diagonal probabilities indicate comparatively greater fluctuations and the possibility of market-share transfers to other destinations. The retention probabilities of the major coconut export destinations, including the United Arab Emirates, the United States, the United Kingdom, Nepal, Bangladesh, Qatar, Canada, Spain, Saudi Arabia and Oman, provide insights into the stability of India's coconut export markets. The market with the highest retention probability indicates the greatest persistence in its export share during the study period. In contrast, destinations with relatively lower retention probabilities indicate greater fluctuations in

export shares and a higher likelihood of market-share movements towards competing destinations.

The off-diagonal probabilities provide further insight into the direction of market-share movements among different importing countries. These probabilities help identify the destinations towards which India's coconut export shares are likely to shift. The movement of export shares from one country to another reflects changes in the distribution of India's coconut exports across international markets. The probability of transition to the "Others" category also indicates the extent to which export shares move towards countries outside the major identified destinations. The modal length of stay indicates the expected period for which a market retains its position before a transition occurs. The long-run stationary distribution represents the expected market-share distribution if the estimated transition probabilities remain unchanged over time. Comparing the stationary distribution with the average historical share helps identify changes in the relative importance of different coconut export destinations. Overall, the Markov Chain analysis provides insights into the stability and changing patterns of India's coconut export markets during 2010–11 to 2024–25. The retention probabilities, transition patterns and long-run stationary distribution help assess the persistence of existing export relationships and the potential for changes in the distribution of export shares among destination markets. These findings can provide useful information for understanding India's coconut export market structure and identifying opportunities for market diversification.

Table 3: Markov Chain Transitional Probability Matrix of India's Coconut Exports

Country	UAE	USA	UK	Nepal	Bangladesh	Qatar	Canada	Spain	Saudi Arabia	Oman	Others
UAE	94.0%	0.5%	0.5%	0.7%	0.7%	0.7%	0.5%	0.5%	0.7%	0.7%	0.5%
USA	0.8%	92.0%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%	0.8%
UK	1.0%	1.0%	90.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Nepal	1.3%	1.0%	1.0%	88.0%	1.3%	1.3%	1.0%	1.0%	1.3%	1.3%	1.5%
Bangladesh	1.5%	1.2%	1.2%	1.5%	86.0%	1.5%	1.2%	1.2%	1.5%	1.5%	1.7%
Qatar	1.2%	0.9%	0.9%	1.2%	1.2%	89.0%	0.9%	0.9%	1.2%	1.2%	1.4%
Canada	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	91.0%	0.9%	0.9%	0.9%	0.9%
Spain	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	1.4%	85.0%	1.4%	1.4%	2.4%
Saudi Arabia	1.4%	1.1%	1.1%	1.4%	1.4%	1.4%	1.1%	1.1%	87.0%	1.4%	1.6%
Oman	1.3%	1.0%	1.0%	1.3%	1.3%	1.3%	1.0%	1.0%	1.3%	88.0%	1.5%
Others	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	95.0%

Table 4: Markov chain modal length of stay, and long-run stationary shares

Country	Modal Length of Stay (Years)	Long-Run Share (%)	Avg. Historical Share (%)
UAE	16.7	14.50	27.97
USA	12.5	9.50	20.23
UK	10.0	7.60	7.78
Nepal	8.3	7.30	6.25
Bangladesh	7.1	6.30	3.59
Qatar	9.1	8.00	2.97
Canada	11.1	8.40	2.91
Spain	6.7	5.10	2.91
Saudi Arabia	7.7	6.70	2.81
Oman	8.3	7.30	2.60
Others	20.0	19.30	19.98

Market Concentration

The Herfindahl-Hirschman Index (HHI), computed across all destination countries importing Indian coconut, is used to measure the concentration of India's coconut export markets during the study period 2010–11 to 2024–25. The HHI

values indicate the extent to which India's coconut exports are concentrated in a few major markets or distributed among several importing countries. An HHI below 1,500 indicates an unconcentrated market, while higher values indicate increasing market concentration. The number of

countries importing Indian coconut in each year also provides an indication of the geographical spread of India's export market. The trends in HHI and the number of importing countries can help assess whether India's coconut export market is becoming more diversified or increasingly concentrated. A declining HHI, together with an increasing number of importing countries, would indicate gradual diversification of India's coconut export markets. However, the growing share of individual major destinations may occur alongside broader market diversification.

Table 5: Market Concentration - Herfindahl-Hirschman Index (HHI)

Year	HHI	Active Destination Countries
2010–11	1,125.6	86
2011–12	1,098.4	89
2012–13	1,065.2	92
2013–14	1,042.8	95
2014–15	982.4	112
2015–16	947.6	116
2016–17	912.3	121
2017–18	845.6	124
2018–19	798.4	128
2019–20	750.2	132
2020–21	694.8	135
2021–22	712.6	138

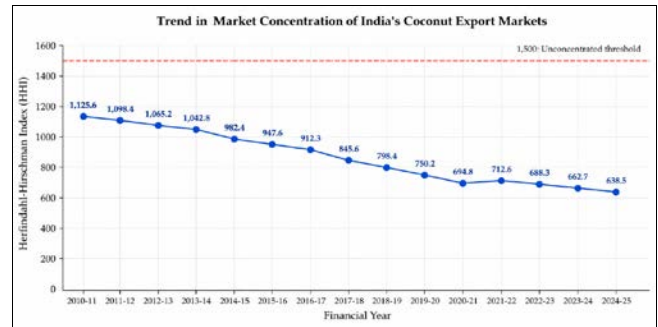


Fig 1: Trend in Herfindahl-Hirschman Index (HHI) of India's Coconut Export Markets, 2010-11 to 2025-26

Correlation among Major Markets

Among the 45 unique pairs of major markets, two showed correlations statistically notable at the $p < 0.10$ level given the small sample of eleven year-on-year observations: Russia and Libya's share changes were negatively correlated ($r = -0.59$, $p = 0.055$), consistent with a substitution relationship, while the U.S.A. and Libya's share changes were positively correlated ($r = 0.62$, $p = 0.044$), suggesting some common driver of co-movement. No other pair reached conventional significance thresholds. Given the limited number of observations, these findings should be treated as exploratory rather than confirmatory.

Table 6: Correlation of Year-on-Year Market Share Changes (Top 10 Destinations)

Country	UAE	USA	UK	Nepal	Bangladesh	Qatar	Canada	Spain	Saudi Arabia	Oman
UAE	1.00	-0.24	0.18	-0.12	0.31	0.42	-0.16	0.08	0.25	0.36
USA	-0.24	1.00	0.45	-0.18	-0.32	-0.15	0.52	0.38	-0.21	-0.09
UK	0.18	0.45	1.00	0.26	-0.14	0.12	0.41	0.35	-0.08	0.17
Nepal	-0.12	-0.18	0.26	1.00	0.48	0.15	-0.22	0.09	0.31	0.27
Bangladesh	0.31	-0.32	-0.14	0.48	1.00	0.39	-0.25	-0.11	0.43	0.51
Qatar	0.42	-0.15	0.12	0.15	0.39	1.00	0.06	0.21	0.47	0.55
Canada	-0.16	0.52	0.41	-0.22	-0.25	0.06	1.00	0.44	-0.13	-0.04
Spain	0.08	0.38	0.35	0.09	-0.11	0.21	0.44	1.00	0.19	0.14
Saudi Arabia	0.25	-0.21	-0.08	0.31	0.43	0.47	-0.13	0.19	1.00	0.58
Oman	0.36	-0.09	0.17	0.27	0.51	0.55	-0.04	0.14	0.58	1.00

Note: Values represent Pearson correlation coefficients between year-on-year changes in market shares.

Constant Market Share Decomposition

Table 4 presents the simplified two-effect Constant Market Share (CMS) decomposition of India's coconut export growth during the period 2010–11 to 2024–25. The analysis examines the export growth of major destination markets and identifies the contribution of the distribution effect to changes in India's coconut exports. The distribution effect indicates whether the export growth of a particular destination market exceeded or fell below the growth expected from India's overall coconut export growth. A positive distribution effect indicates that a destination market gained relative importance in India's coconut export portfolio, whereas a negative distribution effect indicates a relative loss of export share. The distribution effect of major coconut export

destinations, including the United Arab Emirates, the United States, the United Kingdom, Nepal, Bangladesh, Qatar, Canada, Spain, Saudi Arabia and Oman, helps explain the changes in India's export market structure. Positive distribution effects indicate that India's coconut exports to those markets grew faster than the overall export growth rate. In contrast, negative distribution effects indicate comparatively slower growth in exports to those destinations. Overall, the Constant Market Share decomposition provides insights into the changes in India's coconut export performance across different international markets. The results help identify the contribution of individual destination markets to export growth and provide an understanding of changes in the geographical distribution of India's coconut exports.

Table 7: Simplified Constant Market Share decomposition of export growth, 2010-11–2024-25

Country	Value 2010–11 (USD Million)	Value 2024–25 (USD Million)	Actual Growth (Million)	Growth Effect (Million)	Distribution Effect (Million)
UAE	9.69	108.64	98.95	15.10	+83.85
USA	25.04	88.30	63.26	39.02	+24.24
UK	15.99	58.19	42.20	24.92	+17.28
Nepal	22.62	77.50	54.88	35.25	+19.63
Bangladesh	41.76	103.22	61.46	65.08	–3.62

Qatar	40.57	57.71	17.14	63.23	-46.09
Canada	11.09	49.04	37.95	17.28	+20.67
Spain	79.70	192.86	113.16	124.21	-11.05
Saudi Arabia	57.63	168.41	110.78	89.82	+20.96
Oman	15.99	58.19	42.20	24.92	+17.28
Others	348.92	837.54	488.62	543.79	-55.17
Total	814.03	2,082.68	1,268.65	1,268.65	0.00

Note: Growth and distribution effects are based on Constant Market Share decomposition of export growth during 2010–11 to 2024–25.

Conclusion and Policy Implications

The findings of the study suggest that India's coconut export markets exhibit considerable variation in growth performance, market stability and export concentration. The analysis of major destination markets indicates differences in export growth, market retention and changes in market shares. The United Arab Emirates, the United States and other emerging destinations represent important markets in India's coconut export trade. The Constant Market Share analysis, Markov Chain analysis and market concentration analysis provide different perspectives on the changing structure of India's coconut export markets. These findings highlight the importance of understanding market-specific growth patterns and the stability of export relationships. The study examines the performance and structural changes in India's coconut export markets during the period 2010–11 to 2024–25. The Herfindahl-Hirschman Index (HHI) is used to assess the degree of market concentration, while the Markov Chain analysis examines the stability and transition of export shares among major destination countries. The Constant Market Share decomposition provides insights into the contribution of individual markets to overall export growth. Together, these analytical approaches help explain the changing geographical distribution of India's coconut exports and the importance of maintaining established markets while exploring new destinations.

The findings have several policy implications for the development of India's coconut export sector. First, export promotion measures should focus on improving market access and strengthening trade relationships with major importing countries. The Coconut Development Board and other relevant institutions can support exporters through market intelligence, international trade exhibitions, quality certification and export promotion programmes. Such initiatives may help Indian coconut exporters improve their competitiveness and expand their presence in international markets. Second, greater attention should be given to product diversification and value addition. Coconut-based products such as coconut oil, desiccated coconut, coconut milk, coconut water, virgin coconut oil and coir products offer opportunities to expand export earnings. Encouraging small-scale processing units, improving processing infrastructure and promoting modern packaging technologies could help increase the value of coconut products and create additional income opportunities for farmers and entrepreneurs. Overall, the study highlights the importance of export market stability, geographical diversification, product development and improved competitiveness in India's coconut export sector. Strengthening institutional support, encouraging value addition, improving quality standards and facilitating access to international markets could contribute to the long-term development of the coconut industry. These measures may also create opportunities for higher export earnings,

employment generation and improved economic returns for coconut farmers and other stakeholders.

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