

Factors Affecting Sri Lankan Cinnamon Export Income

T. Marasinghe*, N. Paranawithana, F. Balthazaar, M. Radeesha, K. Wisenthige, R. Jayathilaka and U. Dabare

*SLIIT Business School, Sri Lanka Institute of Information Technology, Malabe, Sri Lanka,
bm21508882@my.sliit.lk

Abstract - Ceylon cinnamon, renowned for its superior flavour and delicate appearance, faces distinctive challenges in the global market due to its higher cost and limited availability compared to cassia cinnamon. The major objective of this paper is to identify and analyse factors influencing the export income of Ceylon cinnamon in the areas of production volume, exchange rate, domestic consumption, and land area. The study quantifies the impact of these variables on export income by applying multiple linear regression analysis to data from the period 1992 to 2022 in Sri Lanka. The findings of this paper depict that variation in the exchange rate, domestic consumption, and land area significantly increase Ceylon cinnamon export income, indicating that cultivation and productivity do improve export earnings. On the other hand, it has shown that production volume negatively affects export income. This suggests that the quality and effective use of production outcomes are lower than expected, which adversely affects export volume and earnings. The research findings would, therefore, be of immense use to policymakers, exporters, and the industry in formulating strategies to enhance the cinnamon export sector in Sri Lanka. Key factors that would help stakeholders include interventions targeting production efficiencies, currency risk management, and maintaining a balance between domestic demand and international market dynamics. The research also fills gaps in the literature by focusing on Ceylon cinnamon and its export dynamics, thereby contributing to the sustainable growth and competitiveness of Sri Lanka's agricultural export sector

Keywords: Ceylon Cinnamon, Domestic Consumption, Exchange Rate, Land Area, Production Volume

I. INTRODUCTION

Sri Lanka, renowned for its unique landscapes and its cultural heritage, has a long tradition of cultivating and exporting high-grade cinnamon, known as Ceylon cinnamon. Cinnamon is a highly valued spice, recognized for its distinctive aroma and flavor, and has been a prime export in the Sri Lankan context. Sri Lankan cinnamon is a highly desired commodity in the global export economy. This research paper will conduct an in-depth analysis of the factors influencing cinnamon exports and how the cinnamon economy is affected by fluctuations in these factors. Iqbal et al. (2012) state that an increase in country's exports can generate a rise in profits, resulting in a balance of investments, and reducing national debt. Additionally, increased export growth enables a country to enhance productivity levels, which in turn boosts exports. Rajabi et al. (2022) pointed out that agricultural exports have generated substantial revenue for certain countries. According to News Wire (2021), the Central Bank of Sri Lanka, reported that rubber, coconut, and cinnamon exports generated \$4 billion in revenue in 2021.

Hewavitharana et al., (2022) noted that earnings from Ceylon cinnamon exports rose significantly from \$46.681 million to \$2.163 billion by 2020, as evidenced by the World Data Atlas 2020. Furthermore, Suriyagoda et al. (2021) highlighted that although the volume of Ceylon cinnamon exports declined in Sri Lanka by 2018, the country remains a leading producer and supply of cinnamon to global markets, holding 80% of the market share in the Ceylon cinnamon market, as stated by De Silva et al. (2021).

According to Sachitra and Chong (2018), export crops such as cinnamon, cloves, and pepper contribute 66.2% to Sri Lanka's export income.

Piyasiri and Wijeratne (2016) observed that over the past five years, the true cinnamon market has encountered a 5% reduction in both value and volume in the global cinnamon market. Moreover, during the last ten years, Sri Lanka experienced a 10% reduction in value and a 5% reduction in volume the global cinnamon market. Senaratne and Pathirana (2020) highlighted that the fact that the Sri Lankan government has implemented various programs, such as incentives, to ensure the growth of the cinnamon industry. Since Ceylon cinnamon is a primary export commodity in Sri Lanka, the government provides subsidies to boost cinnamon exports, which in turn contributes to economic growth. However, Ceylon cinnamon faces competition from major importing countries where Vietnamese, Chinese, and Indonesian cinnamon dominant with their more affordable prices.

Several studies have identified various factors driving export income. Recent research by Abduh (2023) in Indonesia, observes that agricultural transformation influences a reduction in production volume, which directly reduces the quantum available for export. The increased demand for domestic consumption in Indonesia, as shown in this study, reduces the quantum of exports. These results underscore the fine line that countries must tread between domestic demand and international market competitiveness to achieve optimal export performance. Kea et al. (2019) conducted a study on the factors affecting Cambodian rice exports, finding that a favorable exchange rate policy can enhance competitiveness in exports, leading to a boost in exports. The study also demonstrated that an increase in land area boosts rice production, thereby increasing exports. The research study on the factors affecting coffee exports in South Sulawesi province by Arfah and Putra (2020) highlights that an increase in coffee production positively impacts exports. Additionally, this study portrayed that the exchange rate also has a positive relationship with exports, indicating that a favorable exchange rate leads to a rise in exports.

The aim of this research is to identify the extent to which the identified factors impact Ceylon cinnamon export income. This research will contribute to the success of the agricultural export sector by providing insights into the factors affecting the export income of Ceylon cinnamon. Furthermore, it will offer comprehensive knowledge to parties exporting cinnamon and other crops about these influencing factors. Understanding the factors affecting a country's cinnamon exports will enable cinnamon exporters to make informed decisions regarding production, marketing, and trade strategies. Moreover, this research will help improve the competitiveness of Ceylon cinnamon exports and similar agricultural products in the global market, as the findings highlight the positive impact of land area, exchange rate, and domestic consumption on export income. By studying the key factors and their impact, stakeholders can work to improve the efficiency, sustainability, and profitability of cinnamon exports, thereby contributing to the overall success of the agricultural export sector.

II. LITERATURE REVIEW

This literature review examines the main factors impacting Ceylon cinnamon export income, particularly production volume, domestic consumption, exchange rate, and land area. These variables were identified as vital through an extensive review of existing literature on various agricultural commodities (Ngo-Thi-Ngoc & Nguyen-Viet, 2021). Previous research on these crops has demonstrated that production volume, domestic

consumption, land area, and exchange rate are crucial determinants of export income (Ngaruko, 2003).

A. Production Volume

Regarding cinnamon and export competitiveness, it has been observed that cinnamon supplementation reduced levels of inflammation and oxidative stress markers, such as C-reactive protein (CRP) and Zhu et al., (2020). Most of these effects were seen in studies of chronic conditions with increased baseline CRP values when the study lasted over 12 weeks (Vallianou et al., 2019). Important determinants of export competitiveness include the productivity of labor and capital, exchange rates, and GDP, while domestic trade policies also play a role (Paul & Dhiman, 2021). These may not be directly related to the country's cinnamon exports, but they are likely to influence export income. Additionally, a study by Handoyo et al. (2024) states that the import of raw materials directly affects export performance across all technology levels, even though increased imports combined with other factors can reduce exports.

Furthermore, the study by Zinngrebe et al. (2024a) highlights that developing countries play a major role in global food systems, with their production heavily influencing global trade by developed nations, outlining the relationship of trade and its impact on economic growth. The research study by Rahman et al. (2021) in Bangladesh highlights the main role of production quality. The machine vision system for tea grading in their study outlines how a country's production directly affects the export prices, which will have an impact on exports. This results in the assumption that higher production leads to favorable prices, which can be derived from other agricultural goods. Furthermore, the study by Al-Abdulkader et al. (2018) explores the production factors that influence exports. The analysis undertaken in this study uses a mathematical model highlighting the importance of factors such as cultivation practices and market prices. Which highlights that by enhancing these identified factors, countries such as Saudi Arabia can uplift export competitiveness and enhance economic growth. However, Gomez et al., (2022) stated that enhanced production increases profitability through the insight of economies of scale and the capacity to suit substantial export demands.

According to Magsi et al. (2021) as observed from a period of 1994-1995 to 2015-2016, meat production increased at an annual average rate of 3% while exports improved by 32%, implying a much constant growth rate for exports this is due to the increase in domestic production in the country, which shows a clear link between rising production volumes and export volumes, and the importance of systematic increases in production capacity, from domestic consumers to global market access. Moreover, improved production capabilities do affect export performance by facilitating firms to effectively satisfy international market demands as stated by Sonmez Cakir et al. (2024). Accordingly, by strengthening production capacity, the global market opportunities can be utilized, and thus more economic benefits can be acquired by the country, and this emphasizes the strategic importance of production volume to achieve global export demand.

H1: Production volume levels impact cinnamon export income in Sri Lanka

In conclusion, the relationship between export income and production volume is complex and influenced by numerous interconnected factors. The above research studies prominently outline the influence of production volume on a country's export income.

B. Land Area and Export Dynamics

Previous research delves into the direct link between agricultural land and export volume, focusing on studies from Sri Lanka, Indonesia, and the United Kingdom (UK). According to a study by Piyasiri and Wijeratne (2016) certain issues faced by Sri Lankan true cinnamon in the world cinnamon market were outlined. Sri Lanka increasing its cultivated area from 1971 to 2012, production and export levels decreased due to competition from major cassia producers such as Vietnam, China, and Indonesia. This highlights the need to upgrade Ceylon cinnamon cultivation and productivity to maintain competitiveness. Additionally, a study by Wardhana and Ratnasari (2022), investigates the significant effect of agricultural land width and efficient management on total export of agricultural products. Similarly, Nadarista and Setyari (2021), investigate the relationship between land area, clove competitiveness, and Indonesian clove exports from 1990 to 2019. The conclusions of this study highlight a substantial positive effect of land area on clove export quantity. Referring to the case of Sweden by Gomez et al. (2022), the area of land is one of the most significant variables that can define the country's capability for agricultural and resource-based exports. This has the advantages of large coverage yield and resource exploitation that in turn offer large production and export rates. Similarly, the findings of Nuryanto et al. (2023) determine the relationship where the higher extent shows the increased land area enhances export amount. Their work shows that Indonesia's growth of agricultural land has produced a big enhancement in palm oil and rubber export, which demonstrates the positive correlation between the land area and export.

Furthermore, the study by Nguyen (2022) in Vietnam explores the importance of efficient land use and management practices in enhancing export performance. By adopting modern agricultural techniques and optimizing land use, Vietnam has increased its rice and coffee exports, demonstrating that not just the quantity but the quality and management of land area are crucial for maximizing export income. Furthermore, a research study by Picoli et al. (2020) on Brazilian soybean production indicates that land expansion has significantly contributed to the country's position as a leading soybean exporter. Their findings underscore the importance of policy measures that facilitate the sustainable expansion of agricultural land, ensuring that environmental concerns are addressed while boosting export potential. Moreover, Byerlee and Deininger (2011) argue that land reforms and policies promoting equitable land distribution can enhance export performance in developing countries. Their analysis of land tenure systems in Africa shows that secure land rights and access to land resources are critical for enabling smallholder farmers to increase production and participate in export markets. Secure land tenure gives farmers the confidence to invest in their land, adopt new technologies, and increase productivity. Equitable land distribution ensures that more farmers can benefit from the land resources, leading to higher overall production and export volumes.

The study suggests that land reforms that provide secure and equitable land access can be a powerful tool for boosting agricultural exports and promoting economic development in developing countries. According to Huo (2014) the findings of this research study interpret a positive relationship on export competitiveness and related factors, such as the land area towards the competitiveness of exports. Countries with large, irrigated lands may have a positive relationship with agricultural export competitiveness. Land size affects the export competitiveness of the agricultural industry. Having more land available for export agriculture within the country can improve a country's ability to compete in the global market. However, Asliyana and Setyowati (2022) examines the external and internal determinants of crude palm oil exports in Indonesia from 1990-2020,

outlining that the land area is positively associated with the level of Indonesian palm oil exports, which proves a positive relationship. Another research article Khan et al. (2020), analyses the impact of various factors on the export of agricultural products in Pakistan and finds that there is a significant short-run correlation between the area used for agricultural activities and agricultural exports. Here, the increase in the sown area leads to a significant increase in agricultural exports in the short term. The article highlights a positive correlation between the area shown and the exports. It mentions that a 1% rise in the exports in the sown land area raises a 1.963% rise in the exports. This article also proves that there is a positive relationship between the land area and the exports.

H2: Cinnamon land area impacts cinnamon export income in Sri Lanka.

These studies identify a significant relationship between land area and export volume. While land availability is important, factors like production efficiency, crop type, market competition, and technological advancements contribute to export success.

C. Exchange Rate

The relationship between exchange rates and exports is complex, with both positive and negative impacts. This analysis outlines several studies to grasp this dynamic. Research by Khalighi and Fadaei (2017) portrays a positive correlation, conducted on Iranian dates from 1991 to 2011 highlighting that currency depreciation improves production and exports by making goods cheaper for foreign buyers. This can be particularly favorable for agricultural products facing stiff competition. However, exchange rate fluctuations can also pose risk to exporters. Sugiharti et al. (2020) explored the impact of exchange rate fluctuations on Indonesian exports to key partners from 2006 to 2018, discussing that exchange rate volatility affected exports of goods such as rubber and chemicals to certain countries. Belke and Kronen (2019) found that exports present insignificant reactions to minimal variations in exchange rates but show significant reactions when these changes exceed a specific threshold, a phenomenon commonly referred to as bands of inaction. According to Mao (2019) real appreciations of the yuan lead to a decrease in export amounts and reduce the likelihood of market entry into destination markets.

Furthermore, there is a long-term affiliation between exports, exchange rates, and other variables, suggesting they shift together over time (Mathur & Shekhawat, 2021). Vieira and MacDonald (2016) also stated that increased Real Effective Exchange Rate (REER) volatility generally reduces export volumes, particularly in developing and emerging economies. These studies show that the relationship between exchange rates and exports is complex. While currency depreciation can improve exports by making them cheaper, volatility creates uncertainty. This complexity highlights the need for exporters to carefully monitor exchange rates when making strategic decisions. In another study Yunusa (2020) used monthly data from the first month in 2006 to the last month in 2019 in Nigeria to investigate the impact of exchange rate volatility on the volume of crude oil export to Nigeria's trading partners. The study results indicated that the long-run result shows that volatility of the exchange rate of Nigeria's trading partners is statistically significant for all the trading partners except for Canada but with different magnitudes which means the volatility of the exchange rate is very imperative to Nigerian crude oil export to its trading partners: UK, USA, Italy, France, Spain, Canada, and Brazil.

According to Chaitip et al. (2015), this present study used the panel ARDL method to examine how the relationship between the export of pineapple in syrup, and

the Gross Domestic Product of Importer countries (GDP), Exchange Rate between Bhat per currency of importer countries and the Number of populations of importer countries could be found. As a result, this study found when exchange rate increases then those countries also possibly consume more canned pineapple substitutes for other normal goods. Thus, this paper hopefully can help Thai exporters to understand the importer market and lead to the development of pineapple products in the future.

H3: Exchange rate fluctuations impact cinnamon export income in Sri Lanka.

D. Domestic Consumption

The link between domestic consumption and exports is complex, with studies offering contrasting viewpoints. According to Gül (2021) Turkish firms tend to focus on exports when domestic consumption decreases, portraying a substitution effect where firms shift to international markets. This factor may not apply directly to the Asian context, where firms often face strong domestic demand due to factors like climate. The demand in European markets also changes over time, making the situation distinct from other regions. However, Sun et al. (2020) clearly outlines a positive relationship. In developed countries with ample land and labor, increased domestic consumption boosts production capacity to meet higher demand, leading to economies of scale and reducing production costs. Consequently, with excess capacity and lower costs, these countries can export more products competitively. Research by Islam and Hossain (2015), finds a positive correlation between domestic consumption, exports, and economic growth in Bangladesh. Similarly, a study by Sheng Tey et al. (2021) shows that increased Singaporean consumption raises Malaysia's agricultural exports. These findings suggest that increasing domestic demand can stimulate production and exports, particularly in developing economies.

However, Rahmaddi and Ichihashi (2012) offer a cautionary view proving that high domestic consumption can hinder exports by diverting resources away from production for export markets. This underscores the importance of a balanced approach to consumption and export promotion. According to Forte and Carvalho (2024), this indicates that raised domestic demand may urge firms to prioritize local markets, theoretically leading to a reduction in export levels. Conversely, during periods of low domestic demand, firms may improve their export efforts to balance diminished local sales. Hence, consumption, as a component of domestic demand can employ a dual effect on exports, contingent upon market conditions and firms' capacity constraints. Domestic demand incorporating consumption is crucial for the development of the export industry. The paper suggests that domestic demand can positively influence exports by lowering reliance on external demand, thus raising more balanced and high-quality economic growth (Sağlam & Egeli, 2017). As mentioned by Erbahar (2020), this research study explores the relationship between export demand shocks and domestic sales.

However, it observes that export demand shocks can influence firms' expansion in terms of employment, wages, and investment, which may ultimately impact domestic consumption and, subsequently, exports. As stated by the European Central Bank (2015), this article explores the relationship between domestic demand pressure and exports, highlighting a substitution effect wherein weak domestic demand affects firms to intensify their efforts in foreign markets. The relationship between domestic demand and exports is especially stronger during periods of decreasing domestic demand, signaling a strategic shift towards export markets in reaction to domestic market weakness. Similarly,

as stated by European Central Bank (2016) when domestic demand is weak, firms typically strengthen their efforts to penetrate foreign markets, leading to an improvement in exports.

Finally, domestic consumption can impact exports. Increased domestic consumption of a product can decrease the volume available for export, potentially limiting export growth. Conversely, a decreased domestic consumption can free up more supply for the international market, increasing export volumes. Hence, understanding the balance between domestic consumption and export availability is crucial for strategic planning in export-focused industries.

H4: Domestic consumption impacts cinnamon export income in Sri Lanka.

III. METHODOLOGY

This study adopted a deductive approach and quantitative research design, aiming to examine the impact of Ceylon cinnamon export income in Sri Lanka using secondary data from 1992 to 2022. Multiple linear regression was employed as an analytical technique. According to Wildan et al. (2021) domestic consumption, exchange rate, and GDP are identified as independent variables affecting exports in the country. Additionally research McGree et al. (2020) demonstrated that the production and yield of sugar cane influenced sugar cane.

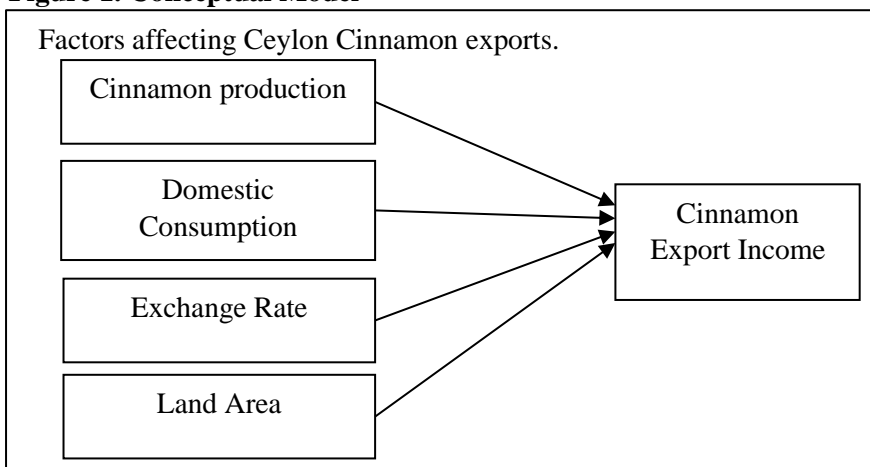
Building on the research, the variables identified for this study were:

- Export Income as Total Export income in the country (TEI),
- Production Volume as GDP (PVGDP),
- Domestic Consumption as Population in the country (DCP),
- Land Area as Total Land Area (TLA), and
- Exchange Rate (ER)

A. Conceptual Model

Based on the previous section, the author developed a conceptual framework, which can be visualized as follows.

Figure 1. Conceptual Model



Source: Authors' compilation.

Data on TEI, PVGDP, and TLA were sourced from the Food and Agriculture Organization of the United Nations (FAOSTAT), while DCP data was obtained from the Macrotrend website, and ER data was identified from the World Bank. These data were sourced from reputable and reliable organizations, forming the basis for the analysis Table 1 provides a summary of the data availability.

Table 1. Data Availability

Variable	Definition	Measure	Sources
TEI	Export Income as Total Export Income	USD/Ton	Food and Agricultural Organization of the United Nations (FAOSTAT) https://www.fao.org/faostat/en/#data/QCL
PVGDP	Production Volume as GDP	Ton	Food and Agricultural Organization of the United Nations (FAOSTAT) https://www.fao.org/faostat/en/#data/QCL
DCP	Domestic Consumption as Population	Ton	Macro Trends https://www.macrotrends.net/global-
TLA	Land Area as Total Land Area	Hectare Per Capita	Food and Agricultural Organization of the United Nations (FAOSTAT) https://www.fao.org/faostat/en/#data/QCL
ER	Exchange Rate	USD	The World Bank https://wdi.worldbank.org/table/4.16 https://data.worldbank.org/indicator/PA.NUS.FCRF?locations=LK https://data.worldbank.org/indicator/PA.NUS.FCRF

Source: Authors' compilation.

All the variables that constitute the mathematical model used in this study are listed in Table 1. The following equation was established for the present study

$$TEI_{it} = \beta_0 + \beta_1 PVGDP_{it} + \beta_2 DCP_{it} + \beta_3 TLA_{it} + \beta_4 ER_{it} + \varepsilon_{it} \quad (1)$$

In this equation, TEI_{it} represents the dependent variable, at time t , and ε_{it} represents the residual error term. The coefficients β_0 , β_1 , β_2 , β_3 , and β_4 represent the intercept and slopes of the regression line, which describe the impact of the independent variables on the dependent variable TEI_{it} .

IV. DATA ANALYSIS AND DISCUSSION

This section provides valuable insights into the variables, their fluctuations, and their effects on cinnamon export income. Table 2 presents the descriptive statistics for the five independent variables in Sri Lanka. Additionally, the table shows depicts the number of

observations (Obs.), mean, standard deviation (SD.), minimum value (Min.), and maximum value (Max.) for the five variables from 1992 to 2022.

Table 2. Descriptive Statistics

	TEI	DCP	PVGDP	TLA	ER
Obs.	31	31	31	30	30
Mean	5.184	5.038	1023.068	0.000896	9.362
SD.	1.266	10.407	513.516	0.001	22.631
Min.	3.459	0.002	431.446	-0.001	-2.489
Max.	8.824	39.824	2103.448	0.005	126.28

Source: Authors' compilation.

Table 2 offers valuable insights into the variations of the variables TEI, DCP, PGDP, TLA, and ER, enabling researchers to gain a clear understanding. Accordingly, there are 31 observations for the variables TEI, DCP and PVGDP, while there are only 30 observations used for TLA and ER. And the variables TEI and DCP have moderate means with standard deviations indicating moderate variability, specifically for the variable DCP, which has a higher standard deviation. The variable PVGDP has the highest value, with a mean of 1023.07 and a high standard deviation of 513.52, showing strong variability. Moreover, the variable TLA has the smallest values, with a mean near to zero and very lowest variation. And ER shows significant variability, ranging from a minimum of -2.49 to a maximum of 126.28, with a mean of 9.36 and a large standard deviation of 22.63. These figures emphasize varying levels of distribution and central tendency within the variables TEI, DCP, PVGDP, TLA and ER.

The model selected to analyse the dataset is multiple linear regression and Table 3 presents the results of the analysis. The dependent variable is TEI, while the independent variables are DCP, PGDP, TLA, and ER. The significance level for this dataset is 0.05.

Table 3. Multiple Linear Regression (MLR)

TEI	Coef.	Robust Std. Err.	t	p>t
DCP	0.0049	0.01355	0.36	0.719
PVGDP	-0.0009	0.00041	-2.30	0.030
TLA	264.277	154.13	1.71	0.099
ER	0.0196	0.0055	3.52	0.002
_cons	5.671	0.5449	10.41	0.000
Observations	30			
R2	0.4151			
Prob>F	0.0001			

Source: Authors' compilation.

The analysis shows that Domestic Consumption (DCP) has a positive impact on Total Export Income (TEI). This finding aligns with Devi, (2014), who observed that India's food processing industry plays a dual role in meeting domestic consumer needs while expanding its global market presence. Similarly, in Sri Lanka, higher domestic use of cinnamon could lead to increased production, thereby boosting export opportunities. Zhang et al., (2023), also highlight that while export-oriented production can drive

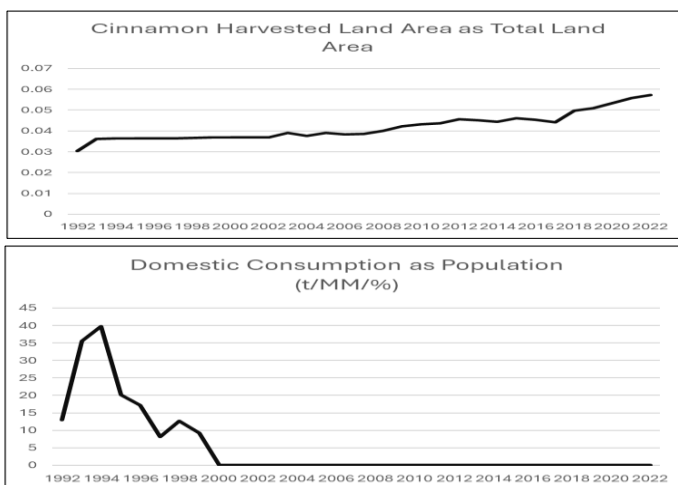
economic growth, it is essential to balance trade to mitigate negative impacts on the economy, quality of life, and the environment.

The study also found that Production Volume (PVGDP) has a negative impact on TEI. High cinnamon production in Sri Lanka can lead to market saturation both domestically and internationally, negatively affecting the relationship between PVGDP and TEI. Land Area (TLA) shows a significant positive impact on TEI. This finding is supported by McGree et al. (2020), who noted that fluctuations in crop yields due to climate factors can impact export volumes and incomes. The positive impact of the cinnamon-harvested area on export income in Sri Lanka is attributed to favorable climate conditions, which support the growth of high-quality cinnamon, enhancing export income.

The results indicate that while DCP and PVGDP are not significant, ER and TLA are significant for Sri Lanka. The positive impact of the Exchange Rate (ER) on TEI is consistent with findings by Tarakçı et al. (2022) who concluded that exchange rate volatility has a complex impact on Turkey's export earnings, with both short-run and long-run effects. The R² value of 0.4151 indicates that 41.51% of the variability in TEI can be explained by the independent variables, suggesting that MLR is a suitable model for this dataset. The model demonstrates a moderate fit and indicates that the independent variables can adequately describe the variation in TEI, making the model dependable for forecasts and conclusions. The F-value of 0.0076 further supports the model's overall significance. The F-value suggests that there is enough evidence to reject the null hypothesis, indicating that the independent variables (DCP, PVGDP, TLA, and ER) collectively have a significant impact on TEI. In conclusion, Sri Lanka's cinnamon export income is influenced by domestic consumption (DCP), production volume (PVGDP), land area (TLA), and exchange rate (ER). Fluctuations in these variables can affect export income either positively or negatively.

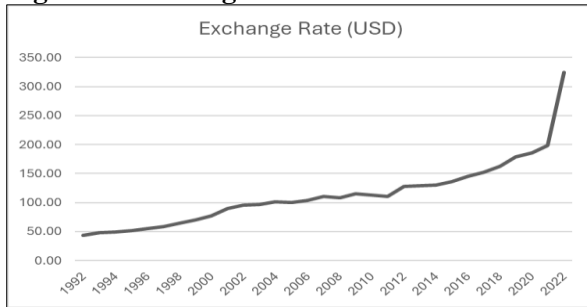
Figure 2 represents the trends in the dependent variable (TEI) and independent variables (PVGDP, ER, TLA, DCP) in Sri Lanka between 1992 and 2022. Figure 2. The graphs depicted in Figure 2 show the fluctuations in the variable's TEI, PV, DC, HLA, and ER.

Figure 2. Cinnamon Harvest Land Area and Population



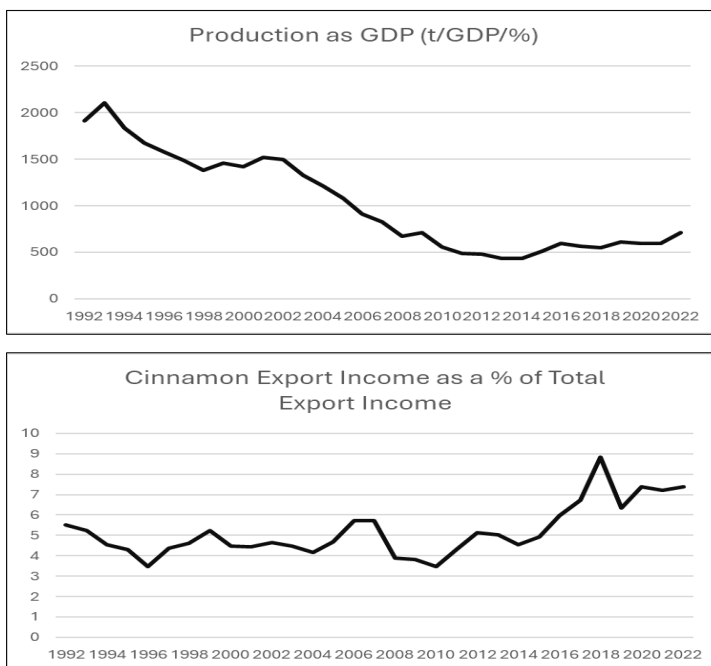
Source: Authors' compilation.

Figure 3. Exchange Rate



Source: Authors' compilation.

Figure 4. Production as GDP% and Total Export Income %



Source: Authors' compilation.

According to figure 2, figure 3 and figure 4 there are five graphs namely TLA, DCP, ER, PVGDP & TEI. The first graph illustrates the land used for cinnamon cultivation as a share of the total land between the period of 1992 -2022. It displays a gradual growth from 1992 to 1996, followed by a trend of relative stabilization up until approximately 2010. Since 2010, the land utilized for the growth of cinnamon has increased further in gradual stages, reaching full height by 2022.

DCP graph shows the fluctuations from 1992 and 2022. There is a steep decline from 1992 to 2000, where it reaches a low level. Later, the DC keeps low up to 2022. The ER graph shows gradual growth from 1992 to 2022. The increase started off more abruptly after 2010 and steepened up in the last several years, peaking around 2022. And the PVGDP graph shows that there has been a great decline from 1992 until around 2008, which then minorly fluctuates up and down, but remaining low. There is a slight increase

after 2012, but it never recovers to the earlier levels. Next, the final graph shows the TEI that is derived from cinnamon exports between 1992 and 2022. The general trend in this graph is rather flat with a slight decline from 1992 to 2000. From 2002 onwards, it fluctuates up and down with a general upward movement that peaks around 2020 before leveling off slightly by 2022. In conclusion, these graphs give an overview of the trends in DCP, PVGDP, TLA, ER, and TEI over a period of three decades.

V. CONCLUSION AND RECOMMENDATIONS

The findings of this study identified that Ceylon cinnamon has significant implications for Sri Lanka's agricultural and export strategies. According to this study, the negative correlation between production volume and export revenue indicates that this sector's prioritization of quantity over quality may lead to lower export revenue. To address this situation, policies should emphasize quality improvement by enforcing minimum quality standards and promoting Good Agricultural Practices (GAP), improved post-harvest handling, and certifications such as organic and fair trade. This shift can improve the global competitiveness of Ceylon cinnamon. Also, considering the sensitivity of export income to exchange rate fluctuations, it is very important to maintain a stable and favorable exchange rate through sound fiscal and monetary policies. Hedging mechanisms for exporters also help in mitigating the risks associated with currency volatility.

The positive relationship between domestic consumption and export revenue highlights the need to strengthen domestic markets for cinnamon-based value-added products that can protect against global market shocks. Sustainable land use policies that optimize land use through regional regulations, replanting and intercropping are needed to ensure both productivity and ecological sustainability. Research and development (R&D) investment is critical to explore new cinnamon-based products, such as essential oils and extracts, allowing Sri Lanka to tap into new markets and value chains. Diversifying export markets beyond traditional regions and reducing dependence on a few key markets will further mitigate risks. To improve export performance at the farm level, extensive training programs should be provided to farmers on modern cultivation techniques, pest control, and export standards.

Furthermore, strengthening the global brand identity of Ceylon cinnamon through international marketing campaigns is essential to distinguish it from lower-quality alternatives and capture premium markets. Finally, infrastructure improvements, including improved transport networks, cold storage, and modernized processing centers, are essential to reduce waste and maintain product quality throughout the supply chain, ensuring Sri Lanka's competitive position in the global cinnamon market.

This study aimed to identify the key factors influencing Ceylon cinnamon export income in Sri Lanka. Through a critical review of existing literature and analysis of data from reliable sources, including the World Bank, the Food and Agriculture Organization of the United Nations (FAO), and Macro Trends, the research identified domestic consumption, production volume, land area, and exchange rate as the primary determinants. Using a multiple linear regression (MLR) model, the analysis revealed that land area, exchange rate, and domestic consumption significantly impact cinnamon export income. The model explained a substantial portion of the variation in export revenue (R-squared = 0.4151), underscoring its robustness and statistical significance.

VI. LIMITATIONS AND FUTURE WORK

While the research provides valuable insights into the factors influencing Sri Lankan cinnamon export income, it is vital to understand the limitations that could affect the results. By identifying these limitations, the credibility and transparency of the study can be easily represented. However, data limitations could be pointed out, including the availability and consistency, this is one of the primary limitations that can be highlighted across the study period (1992-2022). Data obtained from sources such as FAOSTAT, Macro Trends, and the World Bank may have inconsistencies, in some years. For example, the data in each variable may not be updated every year. The export income is affected by certain external economic, political, and climatic factors; however, this study is based on secondary data that will not take these factors into consideration.

Similarly, the exchange rates and other macroeconomic data can alter significantly, affecting the stability of long-term conclusions. In addition, simplification of complex relationships, the multiple linear regression (MLR) model simplifies complex relationships between variables. The model deliberates major variables like production volume, domestic consumption, exchange rate, and harvested land area, it may consider, critical variables such as trade agreements, tariff structures, and government policies, which can also affect cinnamon export income. MLR analysis supposes linear relationships between dependent and independent variables. However, the relationship between the factors affecting Ceylon cinnamon export income will not always be linear. Climate change and extreme weather events can have a substantial impact on cinnamon production and export income; however, these factors are complicated to quantify. The study focuses on Sri Lanka's cinnamon exports but does not account in competition from other countries, especially Cassia cinnamon producers like China and Indonesia.

The increasing market share of these competitors could have a significant impact on Sri Lankan export income. Similarly, while the study focuses on Sri Lanka, its results may not be generalizable to other cinnamon-exporting countries, such as Madagascar or Indonesia, due to differentiations in economic conditions, production methods. Additionally, using historical data to predict future performance carries risks, as future trends may not follow past patterns, especially in an increasingly volatile global economy. By acknowledging these limitations, the study shows an understanding of the factors affecting Sri Lankan cinnamon export income, mentioning the areas for future research and improvements in data collection and model sophistication. Looking ahead, future research should explore additional variables such as cinnamon quality, marketing strategies, and the influence of global trade agreements on export earnings. Understanding these factors will enable agricultural authorities to develop more comprehensive strategies that not only enhance Ceylon cinnamon export income but also solidify Sri Lanka's position in the global market.

REFERENCES

- Abduh, A. J. (2023). Characteristics of highly cited papers in environmental sciences: Trends and authors. Authorea. Retrieved July 30, 2024, from <https://www.authorea.com/users/571220/articles/617134-characteristics-of-highly-cited-papers-in-environmental-sciences-trends-and-authors?commit=51aff29f50d7c83db46f7aa00f09704161d69fd>
- Al-Abdulkader, A. M., Al-Namazi, A. A., AlTurki, T. A., Al-Khuraish, M. M., & Al-Dakhil, A. I. (2018). Optimizing coffee cultivation and its impact on economic growth and export earnings of the producing countries: The case of Saudi Arabia.

- Saudi Journal of Biological Sciences, 25(4), 776–782. Retrieved August 5, 2024, from <https://linkinghub.elsevier.com/retrieve/pii/S1319562X17302206>
- Arfah, A., & Putra, A. (2020). Factors affecting the export of coffee in South Sulawesi Province. University of Muslim Indonesia Repository. Retrieved May 22, 2024, from <https://repository.umi.ac.id/906/2/Factors%20Affecting%20The%20Export%20of%20Coffee%20In%20South%20Sulawesi%20Province.pdf>
- Asliyana, M., & Setyowati, E. (2022). External and internal determinants exports of crude palm oil in Indonesia from 1990-2020. Atlantis Press International, 218, 6. Retrieved January 4, 2024, from <https://www.atlantispress.com/proceedings/icoebs-22/125975175>
- Belke, A., & Kronen, D. (2019). Exchange rate bands of inaction and hysteresis in EU exports to the global economy: The role of uncertainty. *Journal of Economic Studies*, 46(2), 335–355. <https://doi.org/10.1108/JES-01-2018-0022>
- Byerlee, D. R., & Deininger, K. W. (2011). Rising global interest in farmland: Can it yield sustainable and equitable benefits? World Bank Publications. Retrieved from <http://documents.worldbank.org/curated/en/998581468184149953/Rising-global-interest-in-farmland-can-it-yield-sustainable-and-equitable-benefits>
- Chaitip, P., Chaiboonsri, C., & Dewitt, A. (2015). Canned pineapple in syrup from Thailand export by using panel ARDL method. *Procedia Economics and Finance*, 24, 101–107. [https://doi.org/10.1016/S2212-5671\(15\)00624-3](https://doi.org/10.1016/S2212-5671(15)00624-3)
- De Silva, D. A. M., Jeewanthi, R. K. C., Rajapaksha, R. H. N., Weddagala, W. M. T. B., Hirotsu, N., Shimizu, B., & Munasinghe, M. A. J. P. (2021). Clean vs dirty labels: Transparency and authenticity of the labels of Ceylon cinnamon. *PLOS ONE*, 16(11), e0260474. <https://doi.org/10.1371/journal.pone.0260474>
- Devi, C. U. (2014). Trade performance of Indian processed foods in the international market. *Procedia - Social and Behavioral Sciences*, 133, 84–92. Retrieved April 30, 2024, from <https://linkinghub.elsevier.com/retrieve/pii/S1877042814030821>
- Erbahar, A. (2020). Two worlds apart? Export demand shocks and domestic sales. *Review of World Economics*, 156(2), 313–342. <https://doi.org/10.1007/s10290-019-00364-z>
- European Central Bank. (2015). Exports and domestic demand pressure: A dynamic panel data model for the euro area countries. Publications Office. Retrieved July 1, 2024, from <https://data.europa.eu/doi/10.2866/316297>
- European Central Bank. (2016). On domestic demand and export performance in the euro area countries: Does export concentration matter? Publications Office. Retrieved July 1, 2024, from <https://data.europa.eu/doi/10.2866/781870>
- Forte, R. P., & Carvalho, S. (2024). Do domestic market characteristics influence firms' export intensity? *EuroMed Journal of Business*, 19(2), 398–423. <https://doi.org/10.1108/EMJB-09-2021-0129>
- Gomez, L., Duran, J., & Tobasura, I. (2022). Economic study on the export of cape gooseberry produced by Colombian indigenous communities in post-conflict areas to Spain and Europe. *International Journal of Social Economics*, 49(3), 372–388. <https://doi.org/10.1108/IJSE-08-2020-0558>
- Gül, S. (2021). Domestic demand and exports: Evidence from Turkish firms. *Central Bank Review*, 21(3), 105–118. <https://doi.org/10.1016/j.cbrev.2021.03.001>
- Handoyo, R. D., Ibrahim, K. H., Rahmawati, Y., Faadhillah, F., Ogawa, K., Kusumawardani, D., See, K. F., Kumaran, V. V., & Gulati, R. (2024).

- Determinants of exports performance: Evidence from Indonesian low-, medium-, and high-technology manufacturing industries. *PLOS ONE*, 19(1), e0296431. <https://doi.org/10.1371/journal.pone.0296431>
- Hewavitharana, S. D., Kuruppu, I. V., & Priyankara, E. A. C. (2022). Assessment of Sri Lankan cinnamon export competitiveness in the global market. *Sri Lankan Journal of Agricultural Economics*, 23(1), 1–1. <https://doi.org/10.4038/sjae.v23i1.4658>
- Huo, D. (2014). Impact of country-level factors on export competitiveness of agriculture industry from emerging markets. *Competitiveness Review*, 24(5), 393–413. <https://doi.org/10.1108/CR-01-2012-0002>
- Iqbal, A., Hameed, I., & Devi, K. (2012). Relationship between exports and economic growth of Pakistan. *European Journal of Social Sciences*, 32(3), 8. Available at https://d1wqtxts1xzle7.cloudfront.net/30607062/EJSS_32_3_14-libre.pdf
- Islam, K., & Hossain, E. (2015). Domestic demand, export, and economic growth in Bangladesh: A cointegration and VECM approach. *Science Publishing Group*, 4(2015), 10. Available at <http://www.sciencepublishinggroup.com/j/econ>
- Kea, S., Li, H., Shahriar, S., Abdullahi, N. M., Phoak, S., & Touch, T. (2019). Factors influencing Cambodian rice exports: An application of the dynamic panel gravity model. *Emerging Markets Finance and Trade*, 55(15), 3631–3652. <https://doi.org/10.1080/1540496X.2019.1673724>
- Khalighi, L., & Fadaei, M. S. (2017). A study on the effects of exchange rate and foreign policies on Iranian dates export. *Journal of the Saudi Society of Agricultural Sciences*, 16(2), 112–118. <https://doi.org/10.1016/j.jssas.2015.03.005>
- Khan, Z. A., Koondhar, M. A., Aziz, N., Ali, U., & Tianjun, L. (2020). Revisiting the effects of relevant factors on Pakistan's agricultural products export. *Agricultural Economics (Zemědělská ekonomika)*, 66(12), 527–541. <https://doi.org/10.17221/252/2020>
- Kusuma Wardhana, A., & Tri Ratnasari, R. (2022). Impact of agricultural land and the output of agricultural products moderated with internet users toward the total export of agricultural products in three Islamic Southeast Asian countries. *Iqtishodia: Jurnal Ekonomi Syariah*, 7(2), 11–20. <https://doi.org/10.35897/iqtishodia.v7i2.719>
- Magsi, H., Randhawa, A. A., & Shah, A. H. (2021). Halal meat production in Pakistan: Status and prospects. *Journal of Islamic Marketing*, 12(5), 941–950. <https://doi.org/10.1108/JIMA-05-2019-0094>
- Mao, R. (2019). Exchange rate effects on agricultural exports: A firm-level investigation of China's food industry. *China Agricultural Economic Review*, 11(4), 600–621. <https://doi.org/10.1108/CAER-12-2017-0232>
- Mathur, S. K., & Shekhawat, A. (2021). Exchange rate nonlinearities in India's exports to the USA. *Studies in Economics and Finance*, 38(1), 1–12. <https://doi.org/10.1108/SEF-07-2015-0179>
- McGree, S., Schreider, S., Kuleshov, Y., & Prakash, B. (2020). On the use of mean and extreme climate indices to predict sugar yield in western Fiji. *Weather and Climate Extremes*, 29, 100271. <https://doi.org/10.1016/j.wace.2020.100271>
- Nadarista, S., & Setyari, N. P. W. (2021). Indonesian cloves export analysis. *IJISSET - International Journal of Innovative Science, Engineering & Technology*, 8(3), 5. Available at https://ijiset.com/vol8/v8s3/IJISSET_V8_I03_33.pdf

- News Wire. (2021). Highest ever export earnings from tea, rubber, & cinnamon in 2021. Media Articles. Available at <https://www.historyofceylontea.com/ceylon-publications/ceylon-tea-articles/highest-ever-export-earning-in-2021.html>
- Ngaruko, F. (2003). Food and agriculture organization of the United Nations. Available at <https://www.fao.org/agrifood-economics/publications/detail/en/c/121466/>
- Ngo-Thi-Ngoc, H., & Nguyen-Viet, B. (2021). Export performance: Evidence from agricultural product firms in Vietnam. *Cogent Business & Management*, 8(1), 1861729. <https://doi.org/10.1080/23311975.2020.1861729>
- Nguyen, D. D. (2022). Determinants of Vietnam's rice and coffee exports: Using stochastic frontier gravity model. *Journal of Asian Business and Economic Studies*, 29(1), 19–34. <https://doi.org/10.1108/JABES-05-2020-0054>
- Nuryanto, U. W., Ekasari, S., Asir, M., Tuatfaru, M., & Sairmaly, F. A. (2023). The analysis effect of international price, GDP, land area, and substitutional price on export volume of Indonesian palm oil. *JEMSI (Jurnal Ekonomi, Manajemen, dan Akuntansi)*, 9(1), 186–191. <https://doi.org/10.35870/jemsi.v9i1.906>
- Paul, J., & Dhiman, R. (2021). Three decades of export competitiveness literature: Systematic review, synthesis, and future research agenda. *International Marketing Review*, 38(5), 1082–1111. <https://doi.org/10.1108/IMR-12-2020-0295>
- Picoli, M. C. A., Rorato, A., Leitão, P., Camara, G., Maciel, A., Hostert, P., & Sanches, I. D. (2020). Impacts of public and private sector policies on soybean and pasture expansion in Mato Grosso—Brazil from 2001 to 2017. *Land*, 9(1), 20. <https://doi.org/10.3390/land9010020>
- Piyasiri, K. H. K. L., & Wijeratne, M. (2016). Comparison of the cultivated area and the production trends of Ceylon cinnamon with the main competitors in the world's total cinnamon market. *International Journal of Scientific and Research Publications*, 6(1), 5. Available at <https://www.ijsrp.org/research-paper-0116/ijsrp-p4973.pdf>
- Rahmaddi, R., & Ichihashi, M. (2012). How do foreign and domestic demand affect export performance? An econometric investigation of Indonesia's exports. *Modern Economy*, 3(1), 32–42. <https://doi.org/10.4236/me.2012.31005>
- Rahman, M. T., Ferdous, S., Jenin, M. S., Mim, T. R., Alam, M., & Al Mamun, M. R. (2021). Characterization of tea (*Camellia sinensis*) granules for quality grading using computer vision system. *Journal of Agriculture and Food Research*, 6, 100210. <https://doi.org/10.1016/j.jafr.2021.100210>
- Rajabi, Z., Tariq, M. A. U. R., & Muttill, N. (2022). An estimation of virtual trades of embedded water and land through Sri Lankan seasonal crops' trades to improve cropping preferences. *Water*, 14(24), 4101. <https://doi.org/10.3390/w14244101>
- Sachitra, V., & Chong, S.-C. (2018). Resources, capabilities, and competitive advantage of minor export crops farms in Sri Lanka: An empirical investigation. *Competitiveness Review*, 28(5), 478–502. <https://doi.org/10.1108/CR-01-2017-0004>
- Sağlam, Y., & Egeli, H. A. (2017). Doğu Asya için ihracata dayalı büyüme ve iç talep çekişli büyüme hipotezlerinin ampirik analizi. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*. <https://doi.org/10.18092/ulikidince.309279>
- Senaratne, R., & Pathirana, R. (Eds.). (2020). *Cinnamon: Botany, agronomy, chemistry, and industrial applications*. Springer International Publishing. <https://doi.org/10.1007/978-3-030-54426-3>

- Sheng Tey, Y., Suryani, D., F. A., & Illisriyani, I. (2021). Food consumption and expenditures in Singapore: Implications to Malaysia's agricultural exports. *International Food Research Journal*, 16, 09. Available at <https://www.researchgate.net/publication/283763490>
- Sonmez Cakir, F., Adiguzel, Z., Yesilot Zehir, S., & Zehir, C. (2024). Examination of export and production performances of textile companies making export-focused production on the return to normal life from pandemic. *Kybernetes*, 53(1), 274–292. <https://doi.org/10.1108/K-05-2022-0656>
- Sugiharti, L., Esquivias, M. A., & Setyorani, B. (2020). The impact of exchange rate volatility on Indonesia's top exports to the five main export markets. *Heliyon*, 6(1), e03141. <https://doi.org/10.1016/j.heliyon.2019.e03141>
- Suriyagoda, L., Mohotti, A. J., Vidanarachchi, J. K., Kodithuwakku, S. P., Chathurika, M., Bandaranayake, P. C. G., Hetherington, A. M., & Beneragama, C. K. (2021). "Ceylon cinnamon": Much more than just a spice. *Plants People Planet*, 3(4), 319–336. <https://doi.org/10.1002/ppp3.10192>
- Tarakçı, D., Ölmez, F., & Durusu-Çiftçi, D. (2022). Exchange rate volatility and export in Turkey: Does the nexus vary across the type of commodity? *Central Bank Review*, 22(2), 77–89. <https://doi.org/10.1016/j.cbrev.2022.02.001>
- Vallianou, N., Tsang, C., Taghizadeh, M., Davoodvandi, A., & Jafarnejad, S. (2019). Effect of cinnamon (*Cinnamomum Zeylanicum*) supplementation on serum C-reactive protein concentrations: A meta-analysis and systematic review. *Complementary Therapies in Medicine*, 42, 271–278. <https://doi.org/10.1016/j.ctim.2018.12.005>
- Vieira, F. V., & MacDonald, R. (2016). Exchange rate volatility and exports: A panel data analysis. *Journal of Economic Studies*, 43(2), 203–221. <https://doi.org/10.1108/JES-05-2014-0083>
- Wildan, M. A., Imron, M. A., Siswati, E., & Rosyafah, S. (2021). Macroeconomic factors affecting natural gas export management. *International Journal of Energy Economics and Policy*, 11(1), 639–644. <https://doi.org/10.32479/ijeeep.9911>
- Yunusa, L. A. (2020). Exchange rate volatility and Nigeria crude oil export market. *Scientific African*, 9, e00538. <https://doi.org/10.1016/j.sciaf.2020.e00538>
- Zhang, S., Yang, L., & Cao, S. (2023). Neglected negative consequences of using exports to earn foreign exchange. *Research in Globalization*, 7, 100148. Available at: <https://linkinghub.elsevier.com/retrieve/pii/S2590051X23000382>
- Zhu, C., Yan, H., Zheng, Y., Santos, H. O., Macit, M. S., & Zhao, K. (2020). Impact of cinnamon supplementation on cardiometabolic biomarkers of inflammation and oxidative stress: A systematic review and meta-analysis of randomized controlled trials. *Complementary Therapies in Medicine*, 53, 102517. <https://doi.org/10.1016/j.ctim.2020.102517>
- Zinngrebe, Y., Berger, J., Bunn, C., Felipe-Lucia, M. R., Graßnick, N., Kastner, T., Pe'er, G., Schleyer, C., & Lakner, S. (2024). Prioritizing partners and products for the sustainability of the EU's agri-food trade. *One Earth*, 74, 674–686. <https://linkinghub.elsevier.com/retrieve/pii/S2590332224001313>