

AGRICULTURAL PRODUCTS EXPORT STRATEGY: EXPANDING REACH THROUGH DIVERSIFICATION

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Abstract

How to cite this paper: Montes Ninaquispe, J. C., Arbulú Ballesteros, M. A., Ludeña Jugo, D. A., Escalona Aguilar, E., Guzmán Valle, M. d. l. A., Cruz Salinas, L. E., Farfán Chilicaus, G. C., & García Juárez, H. D. (2024). Agricultural products export strategy: Expanding reach through diversification. *Corporate & Business Strategy Review*, 5(4), 53–62. <https://doi.org/10.22495/cbsrv5i4art5>

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ISSN Online: 2708-4965

ISSN Print: 2708-9924

Received: 27.01.2024

Accepted: 28.08.2024

JEL Classification: F4, Q17

DOI: 10.22495/cbsrv5i4art5

The study comprehensively examines the diversification of asparagus exports from Peru, concentrating its analysis on the strategic diversification of markets and companies as pivotal for fostering sustainable growth in the agricultural sector. Utilizing a descriptive and non-experimental quantitative methodology, the research analyzed export data spanning from 2018 to 2023. This analysis was performed using the Herfindahl-Hirschman index (HHI) (Arbulú Ballesteros et al., 2024), a tool designed to measure market concentration levels (Montes Ninaquispe, Pantaleón Santa María, Arbulú Ballesteros, et al., 2023). The findings reveal a significant ongoing dependence on the American market, highlighting it as the primary export destination. However, there is a noticeable trend towards greater diversification among export destinations and the companies involved in these processes. The study notes a progressive decline in market concentration, which suggests a shift towards a more competitive and diversified export environment. Conclusions drawn from the research underscore the critical need to develop strategies that not only diversify markets but also enhance overall competitiveness within the sector. Recommendations from the study stress the importance of tapping into emerging markets, creating value-added products, adopting advanced technologies, and supporting the inception of new businesses. Additionally, it advocates for the promotion of business development across various regions to mitigate risks and encourage more balanced and sustainable economic growth.

Keywords: Exports, Herfindahl-Hirschman Index, Peru, Asparagus, Free Trade, International Trade

Authors' individual contribution: Conceptualization — J.C.M.N.; Methodology — M.A.A.B. and H.D.G.J; Investigation — J.C.M.N., M.A.A.B., M.d.l.A.G.V., and L.E.C.S.; Writing — J.C.M.N. and G.C.F.C.; Supervision — J.C.M.N., D.A.L.J., and E.E.A.; Project Administration — J.C.M.N. and M.A.A.B.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

International commerce, an essential component of the global economic framework, relies on the comparative advantage theory. This theory posits that nations gain by concentrating on the manufacture and export of products and services where they possess a relative superiority (Alfonso & Ismael, 2018). Originally proposed by David Ricardo in the 19th century, this concept continues to be a fundamental element of modern international economic theories. Exports are a significant facet of international commerce, essential for the economic expansion and progression of countries. They facilitate the utilization of comparative advantages, creation of jobs, enhancement of productivity, betterment of the trade balance, and formation of trade agreements (Ando et al., 2022; Kwark & Lim, 2020; Yoshimatsu, 2020). Given the strategic importance of maintaining export dominance, countries explore the option of export diversification. This involves broadening the array of exported products and services, diversifying the export destinations, and increasing the diversity of exporting firms (Canh & Thanh, 2022). The product life cycle theory supports the diversification of exports as a viable strategy that enables nations to progress their economic development and lessen their reliance on a few products or markets (Swathi & Sridharan, 2022). Such diversification offers numerous advantages, like minimizing vulnerability to market and price fluctuations, enhancing competitiveness, and fostering innovation and technological advancement (Gnangnon, 2022). Nevertheless, it presents challenges including the need for investment in new production capabilities, adapting to new market norms and regulations, and managing risks tied to new market ventures (Nguyen et al., 2022).

The strategy of diversifying export goods and markets has been successfully implemented by various nations, particularly in the context of fruit exports (LaFevor, 2022). This strategy has been pivotal for developing countries in promoting economic development and reducing market dependence (Rodríguez Vázquez, 2016). For instance, Mexico has expanded its fruit exports beyond the traditional US market to include Asian and European destinations (Agosin & Chancí Arango, 2015). This expansion involved capitalizing on its comparative advantages, such as favorable climatic conditions for certain crops and proximity to North American markets, and investing in infrastructure enhancements like modernizing facilities and improving logistics (Blanco et al., 2020). Moreover, the establishment of trade agreements with Asian and European nations has facilitated market access (Maya-Ambía et al., 2011).

Spain, similarly, has increased its asparagus exports to regions in the Middle East and North Africa (International Trade Center [ITC], n.d.), driven by the growing regional demand and the suitability of Spanish agricultural conditions for asparagus cultivation. This expansion is also attributed to improved production and export capabilities (Pérez et al., 2022), enabling Spain to reduce its dependence on European markets and enhance its economic resilience (del Rosal, 2019). The diversification of exports provides new market

opportunities and strengthens the economic standing of businesses (Alkhatlan et al., 2020), though it involves complex challenges such as understanding international consumer markets and overcoming non-tariff barriers. Significant investment is required in new production facilities and export infrastructures (Li et al., 2022). These insights underscore the potential of export diversification to advance national economies, influenced by various factors including comparative advantages, market conditions, and strategic policies of governments and corporations (Markakkaran & Sridharan, 2022). The relevance of Michael Porter's competitive advantage theory is also highlighted, suggesting that innovation and improvements in production and export capabilities can enhance competitiveness (Vivoda, 2022).

In a globalized economic landscape, corporate diversification — expanding a company's product or service range — is crucial for sustainability and resilience. This involves exploring new business areas and leveraging inter-company synergies (Swathi & Sridharan, 2022). Market diversification, or promoting products across diverse geographical regions, is equally important for fostering growth and global competitiveness (Zhou & Tong, 2022). This requires strategic market assessment, adaptation to cultural differences, and a robust positioning strategy tailored to each market (Siddiqui & Afzal, 2022). In recent years, global asparagus trade has surged, with leading exporters including Peru, Mexico, China, and Spain, and primary importers being the US, Canada, and Germany (Food and Agriculture Organization of the United Nations, n.d.). Peru's strategy to diversify its agricultural exports is crucial for enhancing the sector's competitiveness. This includes evaluating global demand, consumers' preferences, and navigating regulatory barriers (Montes Ninaquispe, Pantaleón Santa María, Arbulú Ballesteros, et al., 2023). Trade agreements play a critical role in facilitating market entry and minimizing costs (Barrientos-Felipa & Motta Flores, 2020), thereby boosting profitability and the international standing of Peruvian products (Escalante Yaulilahua et al., 2022).

The study identifies a significant gap in the literature regarding the diversification of agricultural product exports in emerging economies, specifically in the context of Peruvian asparagus. While there is extensive literature on economic diversification and comparative advantages, there is a scarcity of research addressing how the diversification of asparagus through exported regions of a country, exporting companies, and destination markets is handled.

The research objective is to analyze the diversification of Peruvian asparagus exports, through the description of the diversification of its exporting regions, companies, and destination markets. The study is based on David Ricardo's theory of comparative advantage and the product lifecycle theory to analyze how Peru's inherent advantages and the maturation stages of its products influence the dynamics of exports. Additionally, Michael Porter's diversification theory is incorporated to understand the benefits and challenges of expanding export markets.

The significance of the study lies in its ability to inform policies that promote greater economic

stability and long-term growth, helping to reduce dependence on a limited number of export markets, companies, and regions of Peru. The study employs a quantitative approach to analyze the export data of asparagus in Peru, and the Herfindahl-Hirschman Index (HHI) is used to measure market diversification.

The structure of the paper comprises various sections that address in detail the topic of diversifying asparagus exports in Peru. It begins with Section 1, where the context and significance of the study are established. This is followed by Section 2, which presents previous studies and relevant theories. Section 3 describes the quantitative, descriptive, and non-experimental approach used, including the use of the HHI to analyze market concentration. Section 4 displays the key findings on global demand and export trends. Section 5 interprets the results, relating them to the theories discussed and highlighting both practical and theoretical implications. Finally, Section 6 synthesizes the main discoveries and suggests strategies to enhance the diversification of asparagus exports in Peru.

2. LITERATURE REVIEW

Research has been conducted on the Mexican mango export industry, heavily reliant on the American market, suggesting Japan as a potential new market and advocating for value addition to create diverse mango-based products (Maya-Ambia et al., 2011). Further research investigated the link between export diversification and performance, using Spain as a case study, and confirmed a direct correlation between these variables (Pérez et al., 2022). In Ecuador, research spanning 2016 to 2020 explored geographical diversification in mango exports, finding a predominant export focus towards the United States and significant public sector involvement in this dependency (Quiñonez Caicedo et al., 2021).

An extensive study involving 101 countries analyzed product diversification and its impact on economic growth, measured by per capita gross domestic product (GDP), noting that developed countries tend to diversify more effectively (Markakkaran & Sridharan, 2022). The diversification of liquefied natural gas exports by major exporting countries like Australia, Qatar, the US, Russia, and Malaysia was also examined, highlighting efforts towards market diversification (Vivoda, 2022).

Research into Peruvian asparagus exports utilized the HHI to assess market concentration, noting a significant market concentration despite a decline in exports to the US by 6.7% in 2022 (Arbulú Ballesteros et al., 2024, p. 263). Similarly, the diversification of Peruvian grape exports from 2013 to 2022 was studied, indicating substantial market concentration in the US and suggesting the need for geographic diversification (Montes Ninaquispe et al., 2024).

The role of international trade in the economy and its foundations in comparative advantage theory were discussed, emphasizing the efficiency of trade and the necessity for export market diversification (Jerzy & Oleksandr, 2022; Halkos et al., 2021). The discussion extended to the importance of added value in the agricultural sector and the potential for

economic stability through diversified exports (Canh & Thanh, 2022; Constantin et al., 2023).

The document elaborates on two primary theories in export diversification: 1) market destination diversification and 2) exporting entity destination theory. The former argues for the benefits of engaging with multiple markets to mitigate risks associated with dependency on a single market (Fassio, 2018; Maertens & Swinnen, 2009; Quiñonez et al., 2021). The latter suggests that a robust number of exporting enterprises can better withstand economic fluctuations (Porter, 2008; Barney, 1991; Karahan, 2017).

3. RESEARCH METHODOLOGY

A quantitative, descriptive, and non-experimental research methodology was utilized to investigate the diversification of asparagus exports from Peru. This method entailed the systematic collection of quantitative data, which was employed to delineate observable characteristics, patterns, and trends within a specific context, without the manipulation of variables or the establishment of controlled experimental environments. The authenticity and reliability of the observations in this non-experimental study were preserved, offering an objective and meticulous portrayal of the asparagus trade's current state without any intervention in the natural market conditions.

To evaluate the extent of diversification in asparagus exports, the HHI was applied. This index is a recognized metric in economics and international trade for quantifying the concentration of markets, companies, and goods, thereby measuring diversification. It was computed by aggregating the squares of the individual market shares of companies or countries within a given market. According to the HHI, a score between 1,000 and 1,800 points to be moderately concentrated, and consider markets in which the HHI is in excess of 1,800 points to be highly concentrated (Antitrust Division U.S. Department of Justice, 2024).

The specific national subheading analyzed was 0709200000, which pertains to fresh or refrigerated asparagus. The analysis drew upon data from Peru's customs declarations available through their online portal, offering a comprehensive and current database of export activities. Consequently, the study encompassed all data recorded by exporting entities from the beginning of 2018 to the end of 2023, thereby ensuring thorough coverage of pertinent commercial transactions. This also facilitated a detailed examination of trends, volumes, destinations, and companies involved in the exportation of asparagus.

An alternative method to contribute to the export analysis of the product could also be the competitiveness analysis through the Balassa index.

4. RESULTS

The analysis of the world demand of asparagus in Table 1, reveals distinctive trends and variability in import volumes. The US experienced its most significant annual growth in 2021, with a 13.51% increase from 2020, while its sharpest decline was between 2022 and 2023, at -11.96%. The average

annual growth for the US was -2.48%, and the standard deviation of these annual changes was 10.17%, indicating moderate volatility in asparagus import volumes. Canada saw its highest growth rate in 2021, at 10.63% over 2020, and faced its largest decrease between 2022 and 2023, a drop of 19.38%. The average annual growth was -6.88%, with a standard deviation of 11.70%, highlighting significant fluctuations. Germany's imports peaked in 2021 with a growth of 19.78% from the previous year, but the greatest decline occurred between 2021

and 2022, by -27.90%. The average growth rate for Germany was -5.21% annually, with a standard deviation of 19.45%, reflecting high volatility. The UK reached its highest annual growth in 2021 at 8.69% and its most significant decrease between 2021 and 2022 at -14.10%. The average annual decline was -5.28%, with a standard deviation of 9.17%. These figures illustrate the varied and often volatile nature of asparagus import volumes among these key economies over the specified period.

Table 1. World demand for asparagus (imports in thousands of tons)

| Country | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|--------|--------|--------|--------|--------|
| United States of America | 256.47 | 265.83 | 301.72 | 263.15 | 231.72 |
| Canada | 23.42 | 24.86 | 27.50 | 21.88 | 17.64 |
| Germany | 24.25 | 22.90 | 27.43 | 19.78 | 19.26 |
| Spain | 13.40 | 10.94 | 13.13 | 13.27 | 13.10 |
| France | 15.61 | 14.73 | 15.73 | 11.90 | 10.13 |
| United Kingdom | 13.20 | 12.53 | 13.62 | 11.70 | 10.58 |
| Netherlands | 12.71 | 10.58 | 13.89 | 11.06 | 9.03 |
| Switzerland | 8.53 | 8.81 | 9.37 | 7.90 | 7.77 |
| Japan | 9.81 | 9.31 | 9.04 | 7.06 | 5.75 |
| Belgium | 6.64 | 6.48 | 8.19 | 5.96 | 6.27 |
| Other countries | 46.81 | 38.81 | 43.26 | 38.03 | 34.15 |
| World ^a | 430.85 | 425.76 | 482.86 | 411.67 | 365.39 |

Note: a. Comprises both reporting and non-reporting countries, along with estimates provided by the International Trade Center and the United Nations Statistics Division.

In Table 2, the US observed its highest annual growth in 2021 with a 4.63% increase from 2020, whereas its sharpest decline occurred between 2021 and 2022, with a decrease of 9.08%. Over the five-year period, the average annual growth for the US was -2.69%, with a standard deviation of 5.67%, reflecting significant volatility. Germany experienced its most substantial growth in 2021, increasing by 66.67% from 2020, marking the most dramatic rise among the four countries. Conversely, its greatest decrease was between 2021 and 2022, with a drop of 38.70%. Germany's average annual growth was 2.75%, with a standard deviation of 38.08%, indicating extremely high volatility relative

to its overall growth. For Canada, the highest growth rate was in 2020, at 4.58% over 2019, and the most significant decline occurred between 2021 and 2022, at -10.37%. The average growth rate for Canada was -2.16% annually, with a standard deviation of 6.53%. Lastly, the UK saw its peak growth in 2021, with an 8.67% increase from 2020, while its most considerable drop was between 2021 and 2022, at -10.38%. The average annual growth for the UK was -3.39%, with a standard deviation of 9.15%. These figures underscore the varied economic trajectories and stability of these major economies over the studied period.

Table 2. World demand of asparagus (million USD)

| Country | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|---------|---------|---------|---------|---------|
| United States of America | 760.51 | 719.75 | 752.92 | 684.66 | 680.58 |
| Germany | 95.13 | 91.43 | 152.39 | 93.42 | 106.05 |
| Canada | 83.04 | 86.84 | 88.70 | 79.49 | 76.00 |
| United Kingdom | 74.32 | 74.10 | 80.51 | 68.88 | 64.45 |
| Netherlands | 65.13 | 60.65 | 80.52 | 62.47 | 60.93 |
| Spain | 57.16 | 55.23 | 62.97 | 60.44 | 71.13 |
| France | 56.10 | 57.71 | 76.36 | 57.01 | 53.71 |
| Switzerland | 48.79 | 53.64 | 67.93 | 55.92 | 60.56 |
| Japan | 60.81 | 57.34 | 53.02 | 41.07 | 38.13 |
| Belgium | 32.75 | 37.79 | 47.95 | 35.44 | 36.93 |
| Other countries | 206.48 | 184.11 | 233.32 | 200.93 | 195.74 |
| World ^a | 1540.21 | 1478.60 | 1696.57 | 1439.73 | 1444.19 |

Note: a. Comprises both reporting and non-reporting countries, along with estimates provided by the International Trade Center and the United Nations Statistics Division.

In Table 3, the US recorded its highest growth in 2021 with a 5.04% increase from 2020, while experiencing the largest decline of 22.15% between 2022 and 2023. The average annual growth rate was -5.39% with a standard deviation of 10.68%, indicating high volatility. In terms of market share, the US held a dominant average of 69.81% over the five years. Spain saw its greatest growth in 2021, increasing by 17.75% from 2020, and its most significant decrease of 8.53% occurred between 2022

and 2023. Spain's average annual growth was -3.66%, with a standard deviation of 10.03%, and it maintained an average market share of 7.93%. The UK experienced its highest growth rate in 2021 at 11.94%, with its sharpest decline of 20.24% between 2022 and 2023. The average annual growth was -8.96%, and the standard deviation was 11.92%, reflecting significant fluctuations. The market share for the UK averaged 6.81%. Lastly, the Netherlands achieved its peak annual growth in 2021 at 25.73%,

while its most considerable decline of 48.87% occurred between 2022 and 2023. The average annual growth rate was -13.80% with a standard deviation of 26.38%, demonstrating extreme volatility. The Netherlands held an average market

share of 7.35%. These data points highlight the variable and often unstable nature of market dynamics among these principal countries within the global context over the observed period.

Table 3. Asparagus exports from Peru by destination market (imports in thousands of tons)

| Country | 2019 | 2020 | 2021 | 2022 | 2023 |
|--------------------------|--------|--------|--------|--------|-------|
| United States of America | 91.20 | 93.30 | 98.02 | 93.26 | 72.60 |
| Spain | 10.98 | 8.34 | 9.82 | 10.34 | 9.46 |
| United Kingdom | 8.95 | 8.04 | 9.00 | 7.46 | 5.95 |
| Netherlands | 9.62 | 7.89 | 9.92 | 8.88 | 4.54 |
| Belgium | 1.13 | 1.23 | 1.58 | 1.46 | 1.00 |
| Mexico | 0.63 | 0.61 | 0.43 | 0.65 | 0.86 |
| Brazil | 1.44 | 0.68 | 0.79 | 0.76 | 0.81 |
| Canada | 1.62 | 1.97 | 1.56 | 0.97 | 0.44 |
| Colombia | 0.33 | 0.33 | 0.46 | 0.50 | 0.41 |
| Germany | 0.75 | 0.27 | 0.81 | 0.41 | 0.32 |
| Other countries | 5.15 | 2.73 | 3.35 | 3.07 | 1.49 |
| World | 131.80 | 125.39 | 135.73 | 127.76 | 97.88 |

Source: Data taken from DAM (customs declarations) registered in SUNAT (2024).

In Table 4, the year 2020 recorded the highest annual increase in the HHI at 14.20%, indicating a significant rise in the concentration of export markets for that year. Conversely, the year 2021 experienced the lowest growth rate, with a reduction of 5.26% in the index, reflecting a decrease in market concentration. The average annual growth of the HHI over these five years was 3.56%, demonstrating a general trend towards greater concentration in

the export destinations of Peruvian asparagus. The standard deviation of the annual growth rates was 6.95%, indicating considerable variability from year to year in market concentration measures. This quantitative analysis provides a comprehensive view of the dynamics of the export markets for Peruvian asparagus, highlighting changes in market concentration over time.

Table 4. Herfindahl-Hirschman Index of destination countries

| Index | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------|---------|---------|---------|---------|---------|
| HHI | 4,962.2 | 5,666.6 | 5,368.5 | 5,479.7 | 5,656.6 |

Source: Data taken from DAM (customs declarations) registered in SUNAT (2024).

In Table 5, Danper Trujillo S.A.C. experienced its most significant growth in 2022, with a 33.33% increase from the previous year. Its largest decline was 32.5% between 2022 and 2023. The average annual growth rate was -11.44% with a standard deviation of 24.32%, suggesting high volatility. Danper Trujillo S.A.C. maintained an average market share of 9.41% over the five years. Complejo Agroindustrial Beta S.A. saw its highest growth in 2021, a 15.63% increase over 2020. However, its most considerable decline occurred between 2022 and 2023, plummeting by 61.76%. The average annual growth was -22.52%, with a standard deviation of 29.54%, indicating very high volatility.

Its average market share was 8.65%. Agricola Cerro Prieto S.A. achieved its peak annual growth in 2021, at 6.67%, while its largest drop was a modest 10.53% between 2022 and 2023. The average annual growth rate was 6.90% with a standard deviation of 8.58%, showing relatively stable growth. The company's average market share was 3.64%. Agrovisión Peru S.A.C. marked its highest growth rate in 2020, increasing by 114.29% from 2019. It faced its largest decline of 6.67% between 2021 and 2022. The average annual growth rate was 21.02% with a standard deviation of 47.23%, reflecting high volatility. Agrovisión Peru S.A.C. held an average market share of 3.63%.

Table 5. Peru's asparagus exports by companies in free on board (FOB) (million USD)

| Company | 2019 | 2020 | 2021 | 2022 | 2023 |
|-----------------------------------|-------|-------|-------|-------|-------|
| Danper Trujillo S.A.C. | 46 | 33 | 30 | 40 | 27 |
| Complejo Agroindustrial Beta S.A. | 45 | 32 | 37 | 34 | 13 |
| Agricola Cerro Prieto S.A. | 13 | 15 | 16 | 19 | 17 |
| Agrovisión Peru S.A.C. | 7 | 15 | 14 | 16 | 15 |
| Sociedad Agrícola Drokasa S.A. | 23 | 17 | 16 | 15 | 13 |
| Kimsa Fresh E.I.R.L. | 0 | 3 | 15 | 14 | 21 |
| Floridablanca S.A.C. | 17 | 13 | 14 | 14 | 21 |
| Twf S.A., Sucursal En El Peru | 6 | 10 | 12 | 14 | 12 |
| Agro Paracas S.A. | 13 | 15 | 18 | 13 | 7 |
| Santa Sofia del Sur S.A.C. | 16 | 13 | 13 | 13 | 13 |
| Other companies | 229.0 | 202.8 | 218.9 | 178.9 | 233.1 |
| Total | 415.4 | 369.5 | 404.4 | 369.7 | 392.1 |

Source: Data taken from DAM (customs declarations) registered in SUNAT (2024).

In Table 6, the HHI shows significant fluctuations in market concentration. The year 2022 recorded the highest increase in the HHI with a 15.57% rise, suggesting an increase in export concentration among fewer companies. In contrast, the year 2023 saw the most pronounced decline in this index, with a drop of 22.43%, indicating considerable diversification in the number of companies involved in asparagus exports. On

average, there was an annual decrease of 5.70% in the index, reflecting a general trend toward a decrease in market concentration among asparagus exporting companies. The standard deviation of these growth rates was 14.84%, highlighting high variability in market concentration year over year. This pattern underscores dynamic changes in the competitive landscape of asparagus exporting companies in Peru.

Table 6. Exporting companies' Herfindahl-Hirschman Index

| Index | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------|--------|--------|--------|--------|--------|
| HHI | 425.08 | 355.79 | 357.00 | 412.60 | 320.04 |

Source: Data taken from DAM (customs declarations) registered in SUNAT (2024).

Table 7 shows that in Ica, the growth was variable, decreasing by 21.13% in 2020, increasing by 14.08% in 2021, falling again by 21.24% in 2022, and rising by 17.58% in 2023. La Libertad exhibited a decrease of 6.18% in 2020, stability with 0.04% in 2021, a growth of 1.31% in 2022, and a decline of 4.09% in 2023. Lima demonstrated a steady increase, with growths of 2.20% in 2020, 8.87% in 2021, 9.82% in 2022, and a notable 27.13% in 2023. Ancash experienced a decrease of 2.63% in 2020, followed by a marked increase of 67.16% in 2021, a drop of

8.62% in 2022, and a rebound of 26.57% in 2023. The average annual percentage growth for these regions was 6.93%, indicating moderate progress over the analyzed period. The standard deviation was 20.78%, reflecting considerable variability in annual growth among the regions, underscoring the volatile dynamics of the asparagus export market in Peru. These figures highlight both the challenges and opportunities in the Peruvian agricultural export sector, with years of strong growth and others of significant contraction.

Table 7. Exports by department of Peru in FOB (million USD)

| Region | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------------------|--------|--------|--------|--------|--------|
| Ica | 176.02 | 138.82 | 158.36 | 124.73 | 146.66 |
| La Libertad | 158.98 | 149.15 | 149.21 | 151.17 | 144.98 |
| Lima | 25.91 | 26.48 | 28.83 | 31.66 | 40.25 |
| Ancash | 17.89 | 17.42 | 29.12 | 26.61 | 33.68 |
| Lambayeque | 28.90 | 30.99 | 36.65 | 34.32 | 23.11 |
| Callao | 7.51 | 5.88 | 1.20 | 1.14 | 2.99 |
| Piura | 0.00 | 0.04 | 0.85 | 0.07 | 0.38 |
| Huanuco | 0.14 | 0.01 | 0.01 | 0.00 | 0.02 |
| Cajamarca | 0.138 | 0.008 | 0.009 | 0.000 | 0.017 |
| Cuzco | 0.000 | 0.625 | 0.124 | 0.001 | 0.007 |
| Other departments | 0.07 | 0.04 | 0.07 | 0.03 | 0.02 |
| Total | 384 | 400 | 387 | 399 | 370 |

Source: Data taken from DAM (customs declarations) registered in SUNAT (2024).

Table 8 reveals a consistent decrease in the HHI for asparagus exports from different regions of Peru over the period from 2019 to 2023, reflecting an ongoing trend toward greater diversification in the market. The least decrease in HHI occurred between 2022 and 2023, while the most substantial decrease happened from 2019 to 2020. The average annual decrease in the HHI was -2.75%, with

a standard deviation of approximately 1.58%, indicating moderate variability in the year-over-year changes in market concentration. These findings suggest that the competitive landscape in the asparagus export market in Peru is becoming less concentrated, potentially due to the entry of new competitors or expansion of smaller existing players across various regions.

Table 8. Exporting regions' Herfindahl-Hirschman Index

| Index | 2019 | 2020 | 2021 | 2022 | 2023 |
|-------|----------|----------|----------|----------|----------|
| HHI | 3,368.93 | 3,187.98 | 3,079.39 | 3,021.26 | 2,980.86 |

Source: Data taken from DAM (customs declarations) registered in SUNAT (2024).

Table 9 reveals a fluctuating trend in the number of participating countries, with a peak in 2022 (42 countries) followed by a significant decline in 2023 (38 countries), indicating a -9.52% decrease and suggesting potential market consolidations or changing export strategies. The average growth rate for countries shows an overall decrease of -1.145% with a standard deviation of 5.12%, illustrating

volatility in international participation. Conversely, the number of companies show resilience with a strong recovery in 2023, increasing by 9.09% from the previous year after a series of declines. The average growth rate for companies was -1.2575% with a higher standard deviation of 6.89%, indicating more significant fluctuations year-over-year.

Table 9. Peru's asparagus exports

| <i>Year</i> | <i>Countries</i> | <i>Companies</i> | <i>Regions</i> |
|-------------|------------------|------------------|----------------|
| 2023 | 38 | 84 | 10 |
| 2022 | 42 | 77 | 11 |
| 2021 | 41 | 82 | 11 |
| 2020 | 40 | 86 | 10 |
| 2019 | 40 | 89 | 8 |

Source: Data taken from Customs Declarations (DAM) registered in SUNAT (2024).

5. DISCUSSION

The current research illustrates trends and volatility in asparagus import volumes, particularly in key markets such as the US, Canada, Germany, and the UK (see Table 1). The significant decrease in US imports between 2022 and 2023 (-11.96%) could reflect a shift in consumer preferences or an increase in domestic production, in accordance with the principles of comparative advantage theory (Alfonso & Ismael, 2018). This reduction contrasts with the growth observed in 2021, highlighting the inherent instability in agricultural product markets due to factors such as climatic variations and changes in trade policies (Ando et al., 2022).

Peru's market diversification strategy in the asparagus sector has proven to be an effective tactic to mitigate these risks. The decrease in market concentration as shown by the annual reduction in the HHI of -5.70% (see Table 6), indicates progress towards effective diversification (Gnangnon, 2022). This is in line with the product life cycle theory, which supports the diversification of exports as a viable strategy for economic development and reducing dependence on a few products or markets (Swathi & Sridharan, 2022).

Fluctuations in global demand and export revenues reflect high volatility and highlight the need for strategic and adaptive planning by exporters and governments. Variations in export prices and demanded quantities, as observed in negative growth rates in important markets such as Germany and the UK (Jerzy & Oleksandr, 2022), suggest that changes in market dynamics must be carefully monitored and managed.

Diversification strategies should not only focus on market expansion but also on innovation and improving productive and export capacities to maintain competitiveness in the global arena (Vivoda, 2022). The increase in the participation of emerging markets and the decrease in dependence on traditional markets, as observed in the expansion of Peruvian asparagus exports to new destinations (Canh & Thanh, 2022), reflect a proactive approach to diversification.

Moreover, the challenges highlighted by Nguyen et al. (2022) related to investing in new production capacities and adapting to regulations in new markets are evident in the reported needs for investment in infrastructure and technology in Peru (Li et al., 2022). These investments are crucial for the long-term sustainability of diversification and the ability to adapt to changing market conditions.

Finally, Peru's approach to diversification is not limited to markets but also extends to companies, as evidenced by the variability of the HHI among companies exporting asparagus (see Table 5). This approach can significantly contribute to economic stability and resilience against external shocks by reducing dependence on a few large companies and fostering a more robust competitive environment (Markakkaran & Sridharan, 2022).

6. CONCLUSION

This study has examined the evolution and challenges of diversifying Peru's asparagus exports, highlighting how implemented strategies have influenced the country's economic stability and growth. The main findings of the research emphasize the diversification of export markets as a crucial strategy to mitigate risks associated with market volatility and fluctuations in international demand. The success of this strategy is reflected in the decrease of the HHI, which indicates a less concentrated market and, therefore, more resilient to external disturbances.

The data reveal high volatility in import volumes and prices in key markets, underscoring the importance of adaptive management and the need for support policies that facilitate exporters' adaptation to changing market dynamics. This aspect is vital to ensure the sustainability and effectiveness of diversification strategies. To sustain and expand participation in international markets, it is essential for countries to invest in innovation and continuous improvement of their productive and export capabilities. This not only enhances competitiveness but also promotes economic stability through value-added products and improved services.

Trade agreements and strategic partnerships have played a fundamental role in accessing new markets. These alliances facilitate entry into difficult markets and enhance the competitive position of countries on the global stage. Despite the evident benefits, diversification involves significant challenges, including the need for substantial investments in technology and training, as well as adaptation to the regulations and standards of new markets. These obstacles must be carefully managed to maximize the benefits of diversification.

In response to the findings of this study on the diversification of Peru's asparagus exports, the following strategies are recommended for multiple key actors within the agricultural and export sector.

For the Peruvian government, it is recommended to implement policies that promote research and development in the agricultural sector, especially in technologies that increase productivity and sustainability of asparagus crops. This investment would not only improve the competitiveness of Peruvian exports but could also reduce the country's dependence on foreign technology imports. Additionally, it is crucial for the government to strengthen trade agreements and strategic alliances with other countries, thus facilitating access to new markets and improving trade conditions for Peruvian exporters. These measures would foster a more favorable trade environment and open opportunities in less explored markets.

For asparagus exporting companies in Peru, it is recommended to diversify their product offerings

through innovation and the development of value-added products. This could include the production of processed asparagus goods that meet healthy and organic consumption trends in international markets. Product diversification would not only reduce vulnerability to fluctuations in commodity markets but could also capture more lucrative and stable market segments. Moreover, these companies should invest in improving their logistical and distribution capabilities to manage international supply chains more efficiently, which is essential for competing in the global market.

Lastly, for farmers' associations and cooperatives, it is advised to focus on continuous improvement of agricultural practices and on certifying their processes and products. Obtaining international certifications, such as Fair Trade or Organic, would not only enhance the perception of their product quality but also allow access to

premium markets. Furthermore, these associations should seek to foster closer collaboration with research institutions and universities to apply innovative and sustainable agricultural practices that can increase yields and crop quality.

This article is pivotal for future research as it provides a detailed and methodologically robust analysis of the diversification of asparagus exports in Peru, offering a model applicable in public policy formulation and the expansion of economic theory on diversification in emerging markets. While focused on Peru, its findings are globally relevant, particularly for similar economies seeking to improve in international trade. However, its limitations include the specificity of the sector and reliance on historical data, suggesting the need for further research addressing these aspects in other contexts and sectors.

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