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Supply chain and agroexport in an agricultural company

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Abstract- The main objective of this research is to identify the relationship between the supply chain and agro-export in an agricultural company. The methodology used is applied, with a quantitative approach, using the hypothetical-deductive method and a non-experimental cross-sectional design. The results indicate that optimized management at each stage of the supply chain contributes significantly to export success. A moderate positive relationship was found between procurement, production, distribution and agroexport, with a particularly strong impact on the distribution phase. This finding suggests that improving logistics, reducing delivery times and optimizing the distribution chain increases a company's competitiveness in international markets. The research concludes that an efficient supply chain is key to sustainability and growth in the agroexport sector, recommending that the company focus on implementing logistics management technologies and training its personnel to improve processes and respond to the demands of the global market.

Key words: supply chain, agroexport, logistics, competitiveness, technology.

I. INTRODUCTION

Considering that there are certain supply chain difficulties in enterprises to adequately supply the international market, the outbreak of the global pandemic has severely affected the export scale of the international agricultural sector. As the course of the health crisis is adjusted and supply chains require an extensive range of tasks consistent with the marketing of services and products, professional advantages are needed to accelerate the performance of organizations, especially in the agri-food sector, an indispensable source for companies located in different sectors around the world [1].

It has been found that product turnover through distribution channels is disrupted by delays in transportation logistics. Faced with this serious situation, the world's vendors are struggling to make the delivery time to their customers [2].

Despite the dire forecasts, the world economy continues to show visible resilience. Growth remains strong and inflation is falling as fast as it is rising. This difficult journey began with supply chain bottlenecks caused by the epidemic, a global food and energy crisis caused by Russia's war on the Ukrainian side and a significant rise in inflation caused by simultaneous global currency devaluations. World growth bottomed out at 2.3% in 2022, long after headline measured inflation peaked at 9.4%. The latest report, Aspects of the World Economy, predicts that growth will hold steady at around 3.2% this year and next, while average headline inflation will fall to 2.8% in 2024 and 2.4% in 2025 [3].

The agribusiness has encountered difficulties in its supply chain that have hindered exports, such as delays in the logistics of materials and inputs. In addition, errors in the production of accurate supplies or materials for raw material processing.

In the concurrent research project the central problem was posed: What is the relationship between the supply chain and agroexport in an agricultural company? The main objective of the study is: To identify the existing relationship between the supply chain and agroexport in an agricultural company. Likewise as specific objectives: (1) To identify the relationship between the supply phase and agro-export in an agricultural company. (2) To identify the relationship between the production phase and agro-export in an agricultural company. (3) To identify the relationship between the distribution phase and agro-export in an agricultural company.

II. THEORETICAL FRAMEWORK

At the national level, some studies are mentioned, such as the increase in wine shipments by optimizing the supply chain procedure based on the sourcing, productivity and distribution process. The objective was to reduce costs and increase export efficiency by quickly adapting logistics processes. The results showed that the organization was not exploiting 100% of its advantages, which shows a valuable growth potential based on the positioning of grapes in inland markets and the growing global demand. There was no delivery schedule to avoid delays in order fulfillment. They concluded that a proper supply chain procedure in agricultural grape exporting companies will help optimize the process, which will indirectly increase the regular export

of the product. Lack of organization or inadequate organization hinders market expansion and increases effectiveness and efficiency. The objective was to promote productive and exporting activities [4].

Another study, about non-traditional agroexports and their contribution to the Peruvian economy. The purpose of this study was to analyze the contribution of non-traditional agroexports and the economic progress of the country, which in its research addressed cases of countries such as Guatemala and Ecuador, and also refers to the steady growth of agroexports that Peru has obtained until today, some of its resulting products are asparagus, avocados and blueberries. This, due to the large production volumes, has had a favorable impact and has generated economic and social changes [5].

Likewise, at the international level, some studies considered the current challenges in logistics and supply chains. The objective was to study the challenges of supply chain and logistics. They emphasized that the supply chain procedure due to the outbreak of the pandemic is having an important impact at the international level, and that the improvement of logistics operations will directly or indirectly enable the global fight against the virus. On the other hand, the magnitude of the impact this disease is having internationally is also drawing attention, and several studies are being conducted in this regard [6].

On the other hand, they investigated the incorporation of the supply chain in the textile apparel industry in Ecuador. They developed a study of the supply chain of shirts in northern Ecuador and proposed a set of objectives and tactics for the improvement of the competitiveness of the parties involved. Therefore, they developed a validation tool that covers aspects of strategy, cooperative information, planning, purchasing, inventory, transportation and cooperative performance. The tool was accepted and this information was processed using descriptive and inferential statistics. This results in a low level of combination of the investigated supply chain. We highlight that the variables that represent the greatest weaknesses focus on strategy, information, collaborative purchasing and inventory. It should be noted that the results obtained served to diagnose, propose and analyze strategies and performance improvement measures for the Ecuadorian textile industry [7].

Regarding theories, on the supply chain, it is said that it emerged in the period of the sixties, when companies decided to integrate related activities by creating the logistics procedure, resulting from the integration of inventory management, warehousing, shipping of finished products and customer service. Material management has also emerged, which consists of raw material purchasing, warehousing, inventory management and planning, production management [8].

It refers to the description, planning and control of materials, information flow and logistics activities of an organization. On the other hand, the supply chain is defined as the association between a group of companies within and among themselves for the purpose of satisfying a consumer through a good or service, whose operation and interconnection are based on the automation of technologies, information, communication and various software, which transcend from horizontal composition to networking and collaboration, with the purpose of taking advantage of the opportunities offered by the production and platform environments [9].

It is necessary to integrate the supply chain across organizational clauses, vertically the entire supply chain, production process and distribution system, and integrate the introduction of new delivery systems. A controlled location between the source of raw materials (primary producer) and the processing plant. The production stage transforms the materials into final products and the distribution stage transports the products. Finally it is transported to the point of sale and purchased by the consumer [10].

In relation to agroexport theories, it is based on international trade (export) theories. These theories examine, explain and predict the consequences of trade transactions between countries, especially exports and imports. International trade involves the buying, selling and exchanging of goods and services in a variety of currencies and methods of payment. Trade liberalization and the lowering of tariff and non-tariff barriers to trade have significantly elevated interactions between different countries or different geographical regions [11].

International trade theory, such as the comparative advantage model, the Hackscher-Ohlin model and the price equalization theorem of elements, emphasize exports where there is a comparative advantage, products that efficiently use the country's resources [12].

III. METHODOLOGY

A. Type and design of research

The present research was of the applied type, since it was based on the study of knowledge for the collaboration to the development of scientific research in the company, where problems of the supply chain of fresh mango and agricultural exports have been identified.

Likewise, the study was considered correlational level, this research situation requires developing a hypothesis that proposes a relationship between two or more variables. It is worth mentioning that the research study was considered cross-sectional, based on the fact that measurements are taken at a single point in time and there is no follow-up of the disease, event, phenomenon or outbreak of interest. This study is of non-experimental design since variables and dimensions were analyzed, it is performed without intentionally manipulating variables.

B. Variables and operationalization

Regarding the variable Supply chain: Set of activities, which is derived from the totality of the subjects involved such as suppliers, manufacturers, wholesalers, distributors, retailers, among others, in the delivery of the good or service [13]. It is operationalized from the dimensions: Procurement phase, production phase and distribution phase with indicators: supply management, purchasing system, production planning, production organization, transportation and warehouse.

The variable Agroexport: Trade transactions between countries, both exports and imports. Agri-food exports in Peruvian areas are extremely beneficial for the economy and social development of the nation [11]. It is operationalized from the dimensions: Export barriers, trade barriers and market diversification with indicators: knowledge barriers, exogenous barriers, tariff barriers, non-tariff barriers, market positioning and market segment. In addition, an ordinal scale was used as a measurement method for both variables.

C. Population, sample and sampling

As for the population, the agricultural cooperative was taken as the population; it has a total of 190 workers, with the following areas: field with 103 workers, processing plant with 50, logistics with 30 and administration with 7 workers. The inclusion and exclusion criteria were also applied.

Thus, the sample selected was employees from the logistics sector (composed of 30 people) considering the inclusion criteria. On the other hand, the sampling technique was considered a census, since the survey was applied to the 30 workers belonging to the logistics area of the cooperative.

D. Data collection techniques and instruments

For the research, the technique used was the survey, as well as the questionnaire, which contains a series of questions.

To ensure the validity of the instrument applied, the evaluation of three experts who met the established requirements was required.

Likewise, the validity and reliability of the questionnaire was evaluated through the application of a pilot test of the instrument, obtaining a Cronbach's Alpha of 0.742 for the supply chain variable and 0.728 for the agro-export variable.

IV. RESULTS

According to the first specific objective, for the correlation between the first dimension of the first variable sourcing phase and the second variable, the following first specific hypothesis was proposed:

H1: There is a positive relationship between the sourcing phase and agroexport in an agricultural company.

H0: There is no positive relationship between the sourcing phase and agroexport in an agricultural company.

In Table 1, it is observed that the correlation coefficient between the dimension "Sourcing phase" and the second variable "Agroexport" is 0.417, which indicates a moderate positive relationship, meaning that as the efficiency in the sourcing phase improves, an increase in agroexport performance tends to be observed. Furthermore, the bilateral significance value is 0.022, which indicates that the correlation is significant because the value is less than 0.05. Therefore, the null hypothesis (0) is rejected, and the alternative hypothesis (1) is accepted, by showing that, if there is a relationship between the first dimension and the second variable, this implies that improvements in the management of the supply phase (such as logistics optimization, cost reduction or better inventory management) could positively favor the performance in the export of agricultural products, increasing the competitiveness of the company.

TABLE 1
CORRELATION BETWEEN THE SOURCING PHASE DIMENSION AND THE SECOND VARIABLE AGROEXPORT

			Dimension 01: Procurement phase	Variable 02: Agroexport
Spearman's Rho	Dimension 01: Procurement phase	Correlation coefficient	1.000	.417*
		Sig. (bilateral)	.	.022
		N	30	30
	Variable 02: Agroexport	Correlation coefficient	.417*	1.000
		Sig. (bilateral)	.022	.
		N	30	30

Note: The correlation is significant at the 0.05 level (bilateral).

Continuing with the second specific objective, for the correlation between the second dimension of the first variable and the second variable, the following specific hypothesis was proposed:

H1: There is a positive relationship between the production phase and agroexport in an agricultural company.

H0: There is no positive relationship between the production phase and agroexport in an agricultural enterprise.

Table 2 shows that the correlation coefficient between the production phase dimension and the agroexport variable is 0.403, indicating a moderate positive relationship between the two, which means that improvements in the production phase (such as process optimization, efficient use of resources, and implementation of agricultural technology) are associated with an increase in agroexport performance. The bilateral sig. value of 0.027, being lower than the significance level, confirms that the correlation is significant. Therefore, the null hypothesis (0) is rejected and

the alternative hypothesis (1) is accepted, indicating that there is a significant relationship between the production phase and agro-exports, suggesting that improvements in the production phase can directly influence the success of agricultural exports, which is relevant for the company that seeks to increase its competitiveness and presence in international markets.

TABLE 2
CORRELATION BETWEEN THE PPRODUCTION STAGE DIMENSION AND THE SECOND AGRO-EXPORT VARIABLE

			Dimension 02: Production phase	Variable 02: Agroexport
Spearman's Rho	Dimension 02: Production phase	Correlation coefficient	1.000	.403*
		Sig. (bilateral)	.	.027
		N	30	30
	Variable 02: Agroexport	Correlation coefficient	.403*	1.000
		Sig. (bilateral)	.027	.
		N	30	30

Note: The correlation is significant at the 0.05 level (bilateral).

In the same way the third specific objective, for the correlation between the third dimension of the first variable and the second variable, the following specific hypothesis was proposed:

H1: There is a positive relationship between the distribution and marketing phase and agroexport in an agricultural company.

H0: There is no positive relationship between the distribution and marketing phase and agroexport in an agricultural enterprise.

In the same way the results of table 3 are interpreted, where the correlation coefficient between the distribution phase dimension and the second variable Agroexport, highlighting a moderate positive relationship, means that, as distribution processes such as logistic efficiency, reduction of delivery times, and optimization of the distribution chain are improved, an improvement in the performance of agroexport is observed. (0.588), and the bilateral Sig. (<0.001) being considerably lower than the significance level of 0.05, indicates that this correlation is significant. We then proceed to reject the null hypothesis (0) and accept the alternative hypothesis (1). By confirming the existence of a significant relationship between the distribution phase and agroexport. This result highlights the importance of distribution efficiency in improving the competitiveness and reach of agricultural products in international markets, which contributes to a better export performance of the company.

TABLE 3
CORRELATION BETWEEN THE DISTRIBUTION PHASEE DIMENSION AND THE SECOND AGRO-EXPORT VARIABLE

			Dimension 03: Distribution and marketing phase	Variable 02: Agroexport
Spearman's Rho	Dimension 03: Distribution and marketing phase	Correlation coefficient	1.000	.588**
		Sig. (bilateral)	.	<.001
		N	30	30
	Variable 02: Agroexport	Correlation coefficient	.588**	1.000
		Sig. (bilateral)	<.001	.
		N	30	30

Note: The correlation is significant at the 0.01 level (bilateral).

And finally it is worth noting the general objective, for the correlation between the first variable and the second variable, the following general hypothesis was put forward:

H1: There is a positive relationship between supply chain and agro-export in an agricultural company.

H0: There is no positive relationship between supply chain and agroexport in an agricultural company.

The results show that the correlation coefficient between the Supply Chain variable and the Agroexport variable is 0.669, obtaining a moderate positive relationship, and with Bilateral Sig. <0.001, this means that it is statistically significant since the value is less than the threshold (0.05). Therefore, the general null hypothesis (0) is rejected, and the general alternative hypothesis (1) is accepted. This underlines the importance of efficient supply chain management to improve the competitiveness and performance of agroexport companies, highlighting that a strategic approach in this area can be a determining factor for success in international markets.

TABLE 4
CORRELATION BETWEEN THE FIRST SUPPLY CHAIN VARIABLE AND THE SECOND AGRO-EXPORT VARIABLE

			Variable 01: Supply Chain	Variable 02: Agroexport
Spearman's Rho	Variable 01: Supply Chain	Correlation coefficient	1.000	.669**
		Sig. (bilateral)	.	<.001
		N	30	30
	Variable 02: Agroexport	Correlation coefficient	.669**	1.000
		Sig. (bilateral)	<.001	.
		N	30	30

Nota: La correlación es significativa en el nivel 0,01 (bilateral).

V. DISCUSSION

According to the first specific objective, the results obtained for this objective reveal a moderate positive correlation between procurement management and agroexport performance. This conclusion is consistent with some studies, which highlight that a well-structured procurement logistics optimizes the supply chain in perishable products, allowing higher quality and competitiveness in international markets [14]. Another study also supports this finding, showing that careful planning of inputs in agricultural sectors is critical to sustain high export standards and reduce risks associated with quality and delivery times [15].

Studies in the analysis of non-traditional agroexports highlight that adequate sourcing is crucial to maintain quality in high export value products, such as asparagus and blueberries, in which Peru has achieved significant growth [5]. In addition, authors point out that adequate sourcing helps small and medium-sized enterprises to increase their competitiveness and reduce risks, allowing them to enter international markets [16].

From a theoretical perspective, it is emphasized that procurement is a fundamental pillar for the efficiency of the entire chain, ensuring that each subsequent stage is aligned with the quality and efficiency objectives of the company, and that adequate synchronization in the acquisition of inputs reduces the risk of interruptions in subsequent stages, which is essential in the procurement of perishable products such as mangos. David Ricardo's Theory of Comparative Advantage, which postulates that countries should specialize in goods that they produce more efficiently, is reinforced here, since efficient procurement management allows the company to maximize its export potential, taking advantage of mango quality as a competitive advantage in international markets [8].

Regarding the second specific objective, the analysis of the production phase in the company's agroexport reveals a moderate positive relationship, which is consistent with the conclusions of studies where they emphasize that optimized and efficient production allows agricultural companies to minimize costs and maximize the use of resources, thus improving the competitiveness of their products in international markets. The challenges of seasonality and climate dependence identified in the company are also common in other agricultural export products [10]. For example, these factors affect coffee and cocoa production in Ecuador, which emphasizes the need for strategies that optimize production to maintain supply [17].

Authors identified in research on the food supply chain in Peru that production management can reduce the impact of demand fluctuations, which is crucial to ensure customer satisfaction in international markets [18]. In terms of theory, it is argued that optimized production contributes to the supply chain responding efficiently to market demands, reinforcing the competitiveness of products in global markets [8].

In addition, the company's results highlight the application of production technologies that allow it to maintain quality standards. Studies have documented the importance of adopting technological innovations in production to improve efficiency and resilience in agroexport sectors [4].

Likewise, the third specific objective, the distribution phase, is the one that shows the strongest relationship with the success of agroexport in the company. This confirms previous findings by authors who found that effective distribution is fundamental for perishable products, such as fruits and vegetables, to reach international markets on time and in optimal conditions [7].

Studies also highlight the importance of adequate distribution on the marketing of agricultural products and the impact of sustainability on small and medium-sized enterprises (SMEs), respectively [17]. Related research indicates that adequate logistics management in small agricultural enterprises has a positive impact on competitiveness and sustainability by reducing risks and improving their positioning in international markets [16].

Studies highlight that the digitization of distribution in the supply chain can reduce costs and improve profitability, an aspect that the company could consider to maximize its efficiency in the agro-export market [19]. Authors highlight how flexibility in distribution has been crucial in times of pandemic, allowing companies to adapt quickly to changes in demand and ensure compliance with delivery times [6]. In terms of theory, it is stated that distribution connects the producer with the final consumer, ensuring customer satisfaction and quality at every stage of the process [8].

The implementation of management and tracking technologies, such as Blockchain, has been highlighted in studies, as a tool of great value in the traceability and transparency of distribution [4].

In relation to the general objective, the results evidence a positive and moderate correlation between both variables, which is significant in the context of Spearman's correlation model with a value of 0.669 and statistical significance ($p < 0.001$). These results support the proposed general hypothesis, which states that an effective supply chain is linked to increased efficiency and success of agro-exporting in the company.

When comparing this finding with other studies, points of coincidence and complementarity are observed. For example, an efficient structure in the asparagus processing chain not only improves the cost structure, but also allows exporting agricultural companies to make more reliable projections for future exports. Similarly, research shows that optimizing the supply chain in Mexico's wine industry reduces costs and increases efficiency in distribution and export, factors that contribute directly to improving international competitiveness [20].

Regarding supply chain theory and its role in sustainability, studies highlight that the integration of logistics and production activities optimizes resources, which coincides with the strategic focus of the company, which seeks a more integrated and collaborative management among the actors in its chain. The adoption of these practices in the cooperative not only increases its capacity to respond to market demands, but also strengthens its competitiveness in the agroexport context [8].

The relationship identified between the supply chain and agroexport in the company underlines the relevance of implementing integrated strategies, including the optimization of key phases, such as procurement, production and distribution, to strengthen its competitiveness in the agroexport environment.

V. CONCLUSIONS

Specific Objective 1: The relationship between the procurement phase and agroexport in the company was determined, the results show a moderate positive correlation (0.417) with a significance of 0.022, which allows accepting the alternative hypothesis. This indicates that efficiency in the procurement phase positively impacts agro-export performance, suggesting that a more optimized and accurate management of inputs and materials would contribute to improve fresh mango export performance in terms of quality and competitiveness.

Specific Objective 2: In relation to the production phase, the analysis evidenced a moderate positive correlation (0.403) and a significance of 0.027, thus accepting the alternative hypothesis. This underlines the importance of production efficiency for agroexports, since optimized production processes make it possible to meet the quality standards required by international markets and increase competitiveness in agricultural exports.

Specific Objective 3: For the distribution and marketing phase, a moderate positive correlation was found (0.588) with a significance of <0.001, which allows us to accept the alternative hypothesis. These results highlight that improvements in distribution and marketing, such as the reduction of delivery times and the optimization of the distribution chain, have a direct impact on the success of agroexports.

General Objective: It was concluded that there is a significant and positive relationship between supply chain and agroexport in the company, which supports the general hypothesis that efficient management at each stage of the supply chain contributes to success in the fresh mango export market. The results show a moderate positive correlation of 0.669, with statistical significance ($p < 0.001$), which is evidence that the company can improve its competitiveness and positioning in the international market if it optimizes its procurement, production, and distribution processes in an integrated manner.

VII. RECOMMENDATIONS

It is recommended that the company develop specific performance indicators to evaluate and improve the procurement phase. This will allow more precise control over the quality and availability of inputs and, together with the implementation of a real-time planning system, will optimize response times and minimize storage costs.

To maximize efficiency in the production phase, it is recommended to invest in continuous staff training on advanced technologies and sustainable production practices. This will not only allow for greater process optimization, but will also ensure the quality of the product destined for export.

As for the distribution phase, it is essential that the company adopt an advanced logistics system to reduce delivery times and optimize the use of strategic routes. The incorporation of traceability technologies, such as GPS, will enable better transportation management, ensuring adequate delivery times, which is key to customer satisfaction and improved positioning in international markets.

For future research, we suggest expanding the scope to other agroexporting companies in the region and considering additional factors, such as technological experience and the age range of the collaborators.

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