

Blueberry Supply Chain in Peru: Planning, Integration and Execution

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Abstract— The Blueberry situation in Peru is in a stage of development, in which it is necessary to incorporate good management practices as well as productive to raise the competitiveness of the enterprises. The findings were synthesized and analyzed, to propose improvements and to support the growth of the small companies in the long term. The improvement proposal is based on the best practices and supply chain models applied in the industry. Also, the research was based on sources of information from researchers with experience in evaluating and analyzing the supply chain of the perishable sector in different scenarios worldwide.

Keywords— *Supply Chain Management, Blueberry, Planning, Integration, Execution, Small- to medium-sized enterprises, Supply Chain*

1. Introduction

Blueberry, a fruit belonging to the group of "superfoods" due to its antioxidant properties, is one of the fruits of greatest growth in demand in the international market. Noting the United States as the largest consuming country of the fruit. To which are added the European and Asian continent, which also have a demand in high growth of the fruit. Among the countries that supply the international market, Peru is one of the South American countries that has become one of the main exporters that supply in this market.

This research aims to identify and analyze the management of the processes in the Peruvian Blueberry Supply Chain (SC), with the purpose of proposing improvements in the strategic management of the companies for the competitive

development in the global blueberry market [1]. In addition, the research is supported in the different recognized models of supply chain management in order to evaluate the performance and efficiency of the chain within the blueberry industry in the southern region of Peru.

In Peru, blueberry is one of the agricultural products that is showing remarkable growth and development, reaching a record figure of US \$ 232.9 million in 2016, which is 140% higher than in 2015, according to the Ministry of Agriculture and Irrigation. However, there is still a large gap to be overcome over competing countries globally. Small enterprises are those that have the greatest limitations for their development, such as: the lack of incorporation of good agricultural practices, systems for monitoring and controlling their processes and the management of standards in the production, storage and transportation processes. If these challenges are adequately managed, companies can be supported in the development of their competitiveness in markets with large competitors [2]

Also, there is a low cultural level that limits the diffusion of the best practices of global agriculture, what prevents its correct incorporation in the companies. This research project seeks to be a facilitating means for the insertion of these practices, since it provides a specific framework based on the best practices and model applied in the industry, which was adapted according to the context and limitations of the local companies studied.

2. Literature Review

2.1 Supply Chain

According to the Council of Supply Chain Management Professionals, the supply chain consists of the material and informational exchanges in the logistics process, from the acquisition of raw materials to the delivery of finished products to the end user. This scope directly affects competitiveness and makes it essential to have a correct alignment of the supply chain with the business strategy to ensure high business performance [3].

Also, for companies to remain competitive in the market must be aware of current trends, which is a critical factor for the success and sustainability of these [1, 5]. In recent years, sustainability and the incorporation of Green Supply Chain Management (GSCM) practices are trends that are considered to have an inherent connection to the supply chain for greater economic performance and to ensure a competitive advantage over others enterprises [6].

On the other hand, critical processes such as sales and operations planning, which play an essential role through operational, sales and financial plans, must be taken into account in the supply chain [8]. Also, management of material flows, which involves synchronizing the supply chain and stability of the material flow, plays an important role in the performance of the supply chain [9]. Similarly, transport for order fulfillment and demand management are processes of great overall impact on its performance, efficiency and effectiveness [10, 11, 12]. These processes should be coupled with supplier relationship management and return management that can affect profitability by their impact on the reputation of firms with stakeholders [13, 14]. Finally, taking into account the various variables in the processes and the vulnerability of supply chains to variations, it becomes necessary supply chain risk management (SCRM) for the development of effective strategies to manage risks according to their source of origin [15].

2.2 Supply Chain Management

According to the CSCMP, supply chain management can be defined as the planning and management of all activities related to procurement, procurement, conversion and logistics management; which through coordination and collaboration with channel partners seeks to satisfy customer needs [16]. In recent years, this has taken on a very important role for companies, because it is now considered that supply chains are competing

instead of them [17]. With supply chain integration and flexibility a key strategic role to produce significant improvements in their business performance, such as internal integration with increased efficiency, greater responsiveness to the supply chain and better quality, delivery, flexibility And cost performance [17, 18, 19].

Also, experts mention that supply chains have become increasingly dynamic, and therefore recommend revising their design more frequently, especially since their design affects the types of relationships between partners, their performance measurement systems and their overall vulnerability to the supply chain. [16, 20]. This is why the supply chain plays a very important role in the company, since through its management it is possible to create a competitive advantage, which is indispensable in a highly competitive market such as the global market.

2.3 Benchmarking

There are several companies that have had various benefits in using benchmarking as part of their efforts to improve supply chain operations. Highlighting among the most frequent benefits is improving quality, reducing sourcing / purchasing costs, reducing unit costs, improving customer service, reducing delivery time, improving revenue, reducing inventory, improved communication and coordination of the supply chain [21]. In the context of small and medium-sized enterprises, Benchmarking can be a highly beneficial tool, since an adequate evaluation and selection of best practices allows to acquire knowledge to improve the strategy and the management [22, 23].

An example of this is the case of a manufacturer, exporter and distributor of fruit drinks in Thailand, which with the use of benchmarking, established standard performances for the assessment and risk levels for the risk management of the suppliers that allowed the improving quality and reducing production delays [24]. Many experts and big companies consider metrics critical for their ability to see and make profitable concessions across the supply chain [25, 26]. Highlighting among them those oriented to the management of time, order and assets as the most used for the management of the supply chain. Therefore it could be stated that the use of benchmarking should be highly considered for the competence of supply chain management as a strong facilitator of the company's performance [27].

2.4 Food Supply Chain Management

Nowadays, the demands of consumers in the food sector require a higher quality of products, and this must be translated by the company into actions such as efficient supply chain design, increased responsiveness, innovation in ways of conservation, among others [28, 29].

For the design of food supply chain management, an overall analysis of the specific characteristics of the chain is required by describing the processes in detail for the understanding of their functioning, dynamics and objectives. Also, it should be taken into account that decision making seeking to strike a balance between logistical cost factors and performance indicators related to quality product [30].

It should be mentioned that there is a limited number of research related to the agro-business, and few authors guide the management of supply chain models under a fully agricultural approach. It should be mentioned that all this literature agrees that the specific characteristics of the food product should be considered in the process of supply chain coordination [31]. It is therefore important to involve at the same level the external and internal members of the supply chain, forming networks of cooperation and coordination that contribute to improve performance throughout the chain, and develop competitiveness in a global context [32, 33].

On the other hand, one of the trends in supply chains is the insertion of Sustainability, demanded by the same consumers and stakeholders [34]. In turn this can be an opportunity to create a competitive market, value chain advantages or by creating value-sharing [35]. In the case of food chains, this becomes a challenge for the creation of competitive advantages. [36] Consider ways to increase sustainability such as transporting fresh food instead of frozen products, as they shorten distances transport and reduce the energy consumption of the cold chain [37], could support the companies to be more sustainable within its supply chain.

2.4.1 Factors Affecting Agri-Food Supply Chains of Fresh Products

Some factors to be taken into account in the management of agro-food chains are the following [30]

- Globalization: Expands the farmers market by forcing them to become more competitive.
- Technological Innovations: It have increased performance and decreased dependence on external labor and climate.
- Trade Agreements: It reduce trade barriers and

increase cross-border competition and cooperation.

- Consumer awareness: Changes in the eating habits of consumers are considered as a challenge for food supply chains.

2.4.2 Food Integration Reference Model

As can be seen in the following figure, a practice for operations management, performance monitoring, and analysis of compliance and improvement of the supply chain in the agro-business can be achieved by seeking the standardization of its processes through an integrated structure of the supply chain.

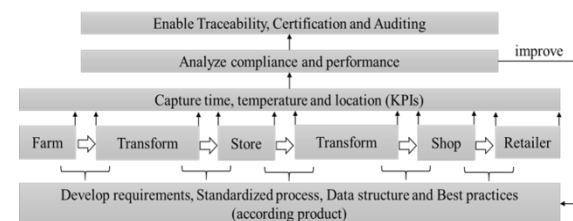


Figure 1. Food Integration Reference Model-H. Donald Ratliff and Amar Ramudhin (2012)

2.4.3 Successful in Supply Chain Management

One of the successful cases of supply chain management in the agro-business is the case of blueberry in Italy. This case shows how the achievement of a supply chain driven by demand implies the activation of innovation processes through the chain. The factors that intervened for improvement in this case were the integration among members, the connectivity between the processes and the research techniques they used [38].

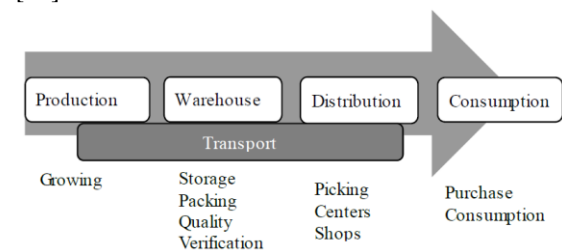


Figure 2. Perishable Fruit Supply Chain. Adapted from Peano, Girgenti, Baudino and Giuggioli (2017)

2.4.4 Supply Chain Management in SME's

In the context of small and medium-sized enterprises, the development of the Supply Chain can take place through multiple strategies such as the insertion of practices that support traceability in the processes of the chain, the search for integration and cooperation of stakeholders as

government actors and competitors [39], and to strengthen links with consumers and end-users [40]. All with the aim of helping the sustainable growth of these companies [41, 42]. Likewise, the development of a new strategy to develop competitiveness can be based on the creation of shared value to overcome organizational and infrastructural limitations that hamper the ability to satisfy the growing demand for products [43].

2.5 Business Process Management

Companies are constantly seeking to improve their productivity to increase their competitiveness. Many adopt diverse techniques, methodology, tools and philosophies in order to improve their processes to achieve this [44]. One of the most effective management improvement tools in all types of organizations is "Process Management". This is described as the design, control and improvement of processes in an organization. Its objective is to help make processes more competitive and more efficient, by controlling the capacity of each process, continuous improvement, flexibility and orientation of all processes towards customer satisfaction and their needs [45]. Also, as experts mention it is important to consider other variables within management by processes such as the integration between cost, quality, delivery and flexibility with organizational knowledge and the incorporation of innovation practices within the company [46].

2.6 SCOR Model

The SCOR model (Supply Chain Operations Reference model) is a highly accepted framework for managing supply chain operations that helps map, develop and benchmark chain operations, and assess and monitor the levels of its supply chain performance. It is oriented to support communication between partners and improve the effectiveness of supply chain management [47, 48]. Furthermore, this model is characterized by its focus on transactional efficiency [49] and adaptive to different contexts, which is a good alternative for developing countries because of their orientation towards operational improvements without investing limited resources and unnecessary efforts [17]. In addition, it is considered useful to identify areas for improvement in order to achieve quick repayment opportunities and at the same time reduce costs.

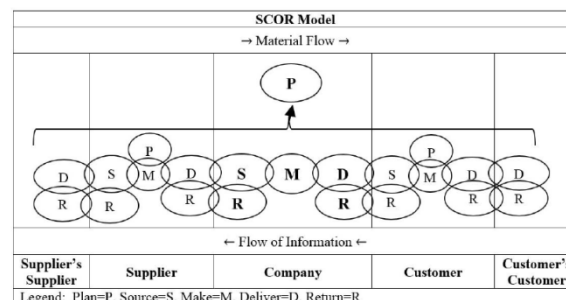


Figure 3. SCOR Model. Adapted from Rotaru K., Wilkin C., Ceglowski A. (2014)

3. Methodology

3.1 Sampling

A qualitative case study investigation was carried out, which provides an explanatory and exploratory approach in order to understand the current situation of the companies under study. In case studies it is recommended to select the maximum number of cases that are available and that can be managed within the study resource limitations. For this reason, we opted for non-probabilistic sampling for convenience, where a sample of 11 blueberry-producing SMEs from the province of Cañete was studied.

On the other hand, in order to collect the information, in-depth interviews were conducted which the objective of knowing and understanding people in their daily lives [50]. Also, questionnaires were taken for the development of closed questions that would allow generalizations of the study sample [51].

3.2 Development of Interviews and Questionnaires

For in-depth interviews, the questions were targeted to farmers and people in charge of supply chain management. These questions were elaborated oriented to a deep knowledge of the execution of the processes based on the SCOR model. Thus, the questions were divided according to the processes of planning, supply, transformation, distribution and return.

The design of the questionnaire was performed and oriented to managers and or managers related to supply chain management in each company surveyed. The purpose of the questionnaire was to analyse current practices in the supply chain according to SCOR model area. The study used the five-point Likert scale as a unit of measure ranging from 1 = "Strongly Disagree" to 5 = "Strongly

Agree". The elaboration of the questionnaires was performed based on literature review, research methodologies for supply chain studies [52] and good practices recommended by the CSCMP [53, 57].

3.3 Reliability Analysis

In order to test the reliability of the information obtained from the questionnaire, the Cronbach's Alpha Coefficient was used as a diagnostic measure, considering the minimum value of 0.70 to consider the information as reliable. The results of the analysis are summarized in the following table, having as result that the information obtained is reliable.

Table 1. Cronbach's Alpha

Process Area	Cronbach's Alpha
Plan	0,953
Source	0,959
Make	0,890
Deliver	0,951
Return	0,956

4. Case of Study: Blueberry Supply Chain in Cañete, Peru

4.1 Current Situation

Peru aims to be one of the leading suppliers of food worldwide. Among the most successful agricultural products in the last year is blueberry. However, there is still a large gap to be overcome with respect to global competitors that need to be overcome in order to achieve that goal.

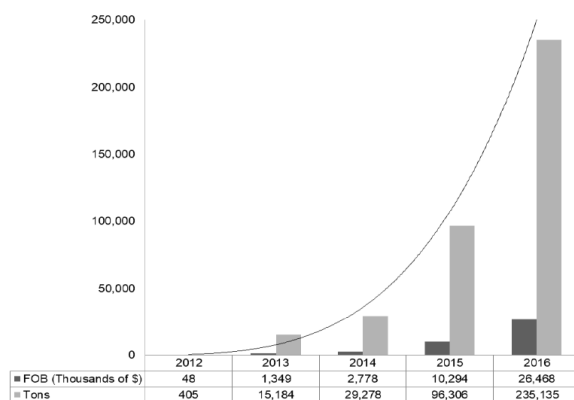


Figure 4. Exports of blueberries from 2012 to 2016. AGRODATA (2016)

The production and export of blueberries is concentrated in the north of Peru. La Libertad, Piura, Cajamarca, followed by Ancash, Lima and Ica are the regions with the highest participation in the blueberry sector, as shown in the table, with La Libertad having a participation of 93.17% in the export of the fruit.

Table 2. Participation in Peruvian Blueberry Exports in 2015. MINAGRI (2016)

Region	Departament	Tons	% Participation
North	La Libertad	9513	93.17
	Piura	45	0.44
	Cajamarca	3	0.03
Center	Lima	299	2.93
	Ica	202	1.98
	Ancash	148	1.45

Although Libertad is the department with the largest participation, our research focused on Cañete-Lima, because it is where the largest concentration of small companies is located, and the objective of the research is to propose a model of improvement that supports its growth and development.

4.1.1 Mapping of the Blueberry Supply Chain

The Supply Chain structure begins with the acquisition of raw materials, supplies and materials, continuing with the coupling of these in their respective warehouse centers, where they then go to the blueberry funds to go through the production process in the crop field. In some cases some companies use one broker for export while others do it directly. Among the main clients are the United States, Canada, Belgium, Germany, among others.

Regarding transport, Cañete uses only the airway because it currently does not present as the levels of production required to ship by sea in a profitable way. Added to this is the difficulty that companies still face in arriving at the dates of planned commercial windows. This is caused mainly by the current limited knowledge of their production in Peruvian lands and the variable climate of the zone, which in turn makes it difficult for them to know the appropriate pruning dates for their production.

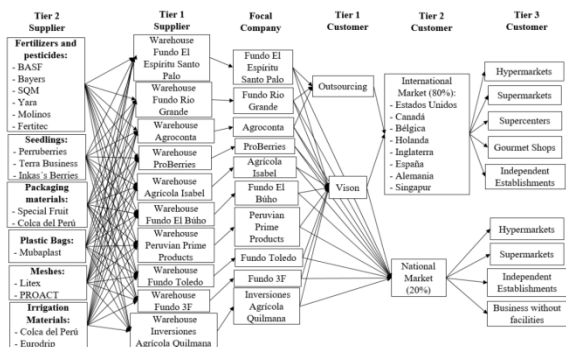


Figure 5. Mapping of the Blueberry Supply Chain in Cañete, Peru (2017)

4.2 Problems Identified

Currently, in Cañete there are no documented procedures and standardized techniques within any of the processes evaluated. Likewise, most companies do not present information on their production, suppliers, returns, etc. in an orderly way since all the records have it in physical. Also, communication between the producing companies and the distribution centers is limited, since it is only carried out for the coordination of product delivery. On the other hand, production losses were observed, mainly due to the fact that the quality requirements were not met or because the transit time was very long and in inadequate conditions, which aggravates the product life even more, thus generating high costs and also lower profit margins, and therefore lower profitability and competitiveness. After analyzing the current situation of Management of the Blueberry Supply Chain in Cañete, the main problems listed below were identified. It is important to emphasize that these companies are in the initial stages of business growth.

Table 3. Current Practices in Cañete Blueberry Supply Chain

Process Area	Current Practices	Percentage (%)
Plan	Do not plan strategically the supply chain	82
	Do not define business address	82
	Most do not perform performance measurement management	73
Source	Absence of criteria for selection of suppliers	45
	Lack of coordination in supply schedules	73
	Information is not shared with suppliers	55
Make	Inadequate programming of inputs	64
	Lack of alignment with good international agricultural practices.	45
	Inadequate Document Management	55
Delivery	Distribution Plans Not Established Properly	55
	An adequate Transportation Management procedure is not used	45
	Do not manage a Risk Management that includes global variables	82
Return	There is no adequate return assessment system	64

5. Hypothesis

The tentative hypotheses regarding the operation of the proposed supply chain management are shown below:

- Employing a model of supply chain management in blueberry enterprises oriented to the improvement of planning and execution will increase the performance of the processes involved
- Incorporating good integration practices will improve connections and interrelations among members in the supply chain.

6. Proposed Model

The proposed model consists of the combination of the Process-Based approach and the SCOR (Supply Chain Operations Reference) methodology, and good agricultural practices. This model was adapted for blueberry small enterprises. The long-term goal for this enterprises is to achieve the consolidation of their production destined for the international market, and to export by themselves. This proposal is aligned to the main problems identified, for which it is proposed:

- Strategic guidelines for the processes that integrate the chain: In order to provide direction to the enterprises, by establishing a general objective for the Supply Chain, which will be translated to specific objectives for each process. It is necessary for the planning to have a structured tasks of integral form to aid the decision making at the moment of the implementation [54].
- Planning and Control of Processes: It is necessary to define each process, both its scope and actors involved, so that each one knows what its function is to fulfill each process plan and in this way to moderate the relations of integration in the performance of the members [55]. It is also essential to evaluate their performance, which is why each process will be accompanied by a system of strategic metrics that help them to make decisions.
- Integration between processes and members: Another important aspect identified as a point of improvement is the search for a global integration throughout the supply chain, since this has a positive and direct impact on its performance [56]. For this, a system of information exchange is proposed along the chain, as well as a system of

indicators to measure the performance of suppliers and distributors.

These guidelines are aimed at improving and complying with the good practices established by the CSCMP according to the process area, based on what has been diagnosed to increase the competitiveness of the blueberry companies. [57]

PROCESS AREA	INADEQUATE (1)	POOR (2)	COMMON (3)	GOOD (4)	BEST PRACTICE (5)
PLAN					
SOURCE		●	●	●	●
MAKE			●	●	●
DELIVER			●	●	●
RETURN		●	●	●	●

Figure 6. Analysis of Best Practices of CSCMP by Process Area in Peru. Interviews (2017)

A Wire Diagram was developed, which shows how the interrelationship of supply chain processes is used. In which it is put in value what is the flow of materials and information along the chain, to elaborate an adequate channel of communication that foments an integral involvement [58].

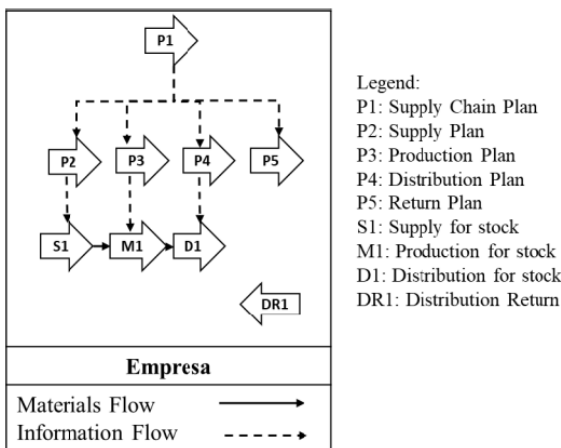


Figure 7. Wire Diagram

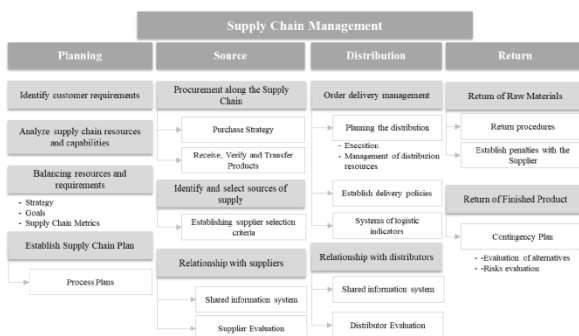


Figure 8. Proposal Design of the Supply Chain Management Framework

Planning

The objective for this process area is to provide strategic guidelines to all processes to provide an objective targeting to companies.

-This process is in charge of balancing the identified requirements of the customers, for this it collects information of the current blueberry market situation, including the new trends and the requirements of the international market.

-Then it is analyzed what are the capacities and resources available in the Supply Chain, for this it is necessary that the companies make a comprehensive review using the performance indicators to evaluate the level of performance of their processes. This stage includes external members of the company, both suppliers and distributors in the centralization and / or coordination of planning. This would translate into greater operational performance simultaneously among participants [59].

-Finally, a balance between requirements and requirements is made in order to structure the Supply Chain Plan and the Communication Plan for the dissemination to all members of the company.

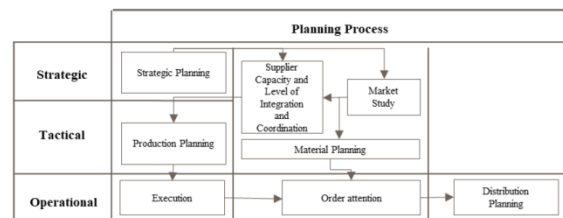


Figure 9. Planning Process for Supply Chain Management. Adapted from Jonsson, P., Rudberg, M., Holmberg, S. (2013)

Source

The objective of the proposed Source Process is to improve the integration with the suppliers of the company through the implementation of a continuous information exchange system.

-The model allows improving supply within the supply chain, in which the purchasing strategy and the operational plan of supply plan are defined.

-This proposed process consists in identifying the requirements of the area, balancing the current capacities and managing with the suppliers for the elaboration of a Supply Plan that allows supplying the supply chain in time and with the required quality.

-The key processes in the Source process are selection, monitoring, development and collaboration with suppliers [59]. This is why the model focuses on creating structures that adequately define how these processes should be performed.

-The establishment of joint objectives and solid supply chain relationships are achieved through the coordination and collaboration of members. That is why it is necessary to explore CS integration and new market opportunities, knowledge and commitment of each CS member. [60, 61].

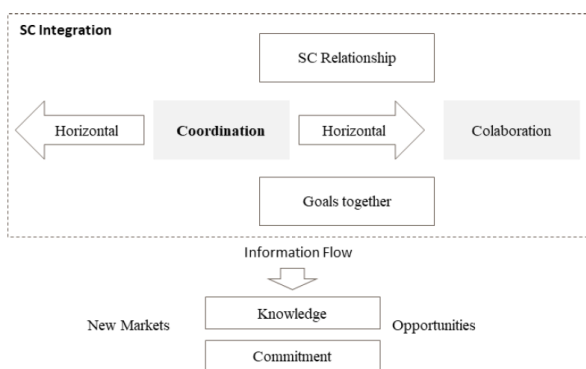


Figure 10. Integration Approach in the Supply Chain. Adapted from Foivos Anastasiadis and Nigel Poole (2015)

Distribution

The objective of the Distribution Plan is to reduce time to increase the useful life of the product, through the strategic management of purchase orders.

-The proposal is aimed at improving integration with the distributor, since it is necessary to create strategic alliances that allow the development of the small enterprises in the international market.

-In this process a procedure is proposed so that the execution of the Distribution is in a standard way and the delivery is expedited.

-Likewise, logistic indicators that allow to measure the performance of this process is key to improve the decision making and, therefore, the management of the company [62].

6.1.1 Comparison: Current Situation vs. Proposal

A comparison was made between the current situation and practices of the sector in contrast with the incorporation of the proposed methodology, which reveals the following differences:

Current Situation	Proposal
Planning Process	
+They do not have integrated planning throughout the supply chain. + This is evidenced by the various excess costs incurred by inefficient current planning.	+Provide strategic guidelines that serve as a basis for the realization of adequate planning in the processes that integrate the supply chain.
Source Process	
+ Coordination between suppliers and companies is limited and does not seek to create long-term relationships. + Frequent shortage, mainly in the production process.	+ It proposes a model that incorporates the integration between suppliers and company, which seeks the mutual benefit. + A supply system is also modeled to efficiently satisfy the needs of the supply chain.
Distribution Process	
+ There is a break in the cold chain, caused by the use of unconditioned transport and poor maintenance of it. + Also, there is no strong relationship with distributors, which often harms both parties.	+ The proposal consider the integration between distributors and enterprises, seeking to create and support a long-term relationship. + Also, it seeks to provide a standard process in the distribution to streamline the flow and supply to the customer.
Return Process	
+ There is a lack of risk management, which increases the risk of falling into shortages and be rejected by the customer.	+ It proposes a model that contemplates the main risks presented in the supply chain with the aim of preventing such risks and added costs by integrating a contingency plan

6.1.2 Value of the Proposal

The proposal presented a model of supply chain management in the blueberry industry in Peru that contemplates aspects such as development of competitiveness and sustainability for the following main reasons concluded from the literature review:

-Competitiveness can positively impact the management of its processes, directly contributing to the achievement of objectives (Planning), fosters the creation of profitable relationships between suppliers, companies and distributors (Integration), and allows consolidating the scope and participation of the actors in the different processes of the Supply Chain (Execution).

-Sustainability is sought that the companies manage to develop over time, continuously seeking the improvement and development of the sector in general.

7. Conclusions

Supply chain management in companies allows them to develop competitiveness and sustainability. Having the supply chain integration and flexibility a key strategic role to produce significant performance improvements, such as internal integration with increased efficiency, greater responsiveness to the supply chain and better quality, delivery, flexibility and cost performance. Regarding the blueberry situation in Peru studied, it was found that the processes that integrate the chain are deficient in comparison of the good practices that use its other competitors. Among the main problems identified are: inefficient process planning, poor process definition which limits control of processes, and lack of integration and cooperation among chain members.

The proposed model seeks to establish strategic steps to assist planning, and identify the scope and actors of each process. Integration being such an important point for supply chain management, the model gathers elements that are consistent points that align with what is required for coordination and integration in the members. Also, it should be mentioned that this model was elaborated based on the revised literature and the best practices recommended by leaders in the chain of supply as the practical improvements by CSCMP, models of management of chain of supply like the SCOR and the recently model for industries proposed by H.

Donald Ratliff and Amar Ramudhin at Georgia Tech.

Finally, according to the analysis, the planning of supply chain processes in conjunction with cooperation and coordination among members prove to be key in supply chains for further growth in the international market. However, in a developing country such as Peru, there are still barriers such as road and education infrastructure that limit the development of agribusiness. Therefore, the support of governmental and / or private institutions in the development of integral proposals that support the improvement of these aspects could play an important role in facilitating the development of agribusiness in Peru.

8. Future Research

The present research was centralized in the blueberry supply chain in Cañete-Lima, however to have a more comprehensive view of the situation at national level in this subject it is necessary to motivate more researchers to study other regions such as Ancash and Ica, places where the blueberry industry is developing positively too. Also, another work for future research is the study of how is the chain management when there is an industrial processing of the fruit, since it presents different factors of performance and management of time along the chain.

It should be mentioned that this research was limited to the study of the main processes mentioned in the SCOR model, so that processes such as marketing, sales, finance and human resources were not taken into account. Therefore it is recommended to carry out an investigation that analyzes these variables in order to evaluate their effect in the supply chain. Also, it is proposed to carry out a more detailed study of the transport and distribution of cranberry in order to study the cold chain, which as analyzed is a critical factor in the blueberry supply chain.

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