FOOD CHAIN INTEGRATION OF THE PANELA IN PUYO, ECUADOR

La integración en la cadena agroalimentaria de panela en el Puyo-Ecuador

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ABSTRACT. Currently, there are deficiencies in small and medium enterprises owned by local Ecuadorian chains, it is necessary to promote a solution to increase local production to keep these businesses in the market and to reduce the gaps in logistics linking the primary production with trading networks, to provide fresh or processed food that competitives to consumers. The aim of this paper is to evaluate the food panela chain integration level, traditional product of the Ecuadorian Amazon region. The method is applied in the chain of panela in the canton Puyo, Pastaza City. The approach on agrifood chains, positively impacts on customer satisfaction. As a technical contribution, a proposed joint business plan for the network under study, which focuses on improving product quality and integration among actors in the local network is proposed. It concludes that panela is a product of high consumption in Ecuador, but the level of integration is lower and more variable deficiency is collaborative planning. Implementing a plan of joint among microenterprises that make up the chain is necessary. The main challenge of developing agrifood chains is the recognition of human potential need to apply the philosophy of networking to improve levels of customers satisfaction.

RESUMEN. En la actualidad existen deficiencias en las pequeñas y medianas empresas que pertenecen a cadenas agroalimentarias ecuatorianas locales, por lo que se hace necesario potenciar una solución para elevar la producción local, mantener este tipo de empresas en el mercado y disminuir las brechas en la logística que une la producción primaria con las redes comercializadoras, para ofrecer los alimentos frescos o procesados, competitivos a los consumidores. El objetivo del presente trabajo fue evaluar el nivel de integración de la cadena agroalimentaria de la panela, producto tradicional de la región Amazónica Ecuatoriana. Se aplica el procedimiento en la cadena de panela en el cantón Puyo, ciudad de Pastaza. El enfoque en cadenas agroalimentarias impacta de forma positiva en la satisfacción de los clientes. Como aporte técnico, se propone una propuesta de un plan de negocio conjunto para la cadena en estudio, que se centra en la mejora de la calidad del producto y la integración entre los actores de la red local. Se concluye que la panela es un producto de alto consumo en el Ecuador, pero el nivel de integración es bajo y la variable de mayor deficiencia es la planeación colaborativa. Se hace necesaria la implementación de un plan de negocio conjunto entre las microempresas que conforman la cadena. El reto principal del desarrollo de las cadenas agroalimentarias es el reconocimiento del potencial humano de la necesidad de aplicación de la filosofía de la integración en redes, para la mejora en los niveles de satisfacción de los clientes.

Key words: supply chain, collaborative planning, stages, integration

Palabras clave: cadena alimentaria, planificación, etapas, integración

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INTRODUCTION

Faced with the growing needs of customers and the influence of the changing environment, companies do not achieve their goals with individual approaches (1), so that the interrelationships among these companies need to survive in the market and achieve competitive services and products.

Supply chains come to this need and form a network of activities and processes, geographically dispersed but functionally related to satisfy the end customer (1, 2) and manifests as a philosophy that encourages integration among network actors (3 -6). Collaborative planning is a way of achieving this integration (7, 8).

The planning process that extends to customers, as the planning process to suppliers (9), is a tool that supports the exchange of information and technologies and the achievement of obtaining goals and joint strategies. Although, it has the risks of sharing information and loss of autonomy in some cases (10-15), so the evaluation of indicators is important to measure the level that is collaborative planning to take joint decisions on behalf of the actors in the chain (4 ,16).

Sugar cane is a staple crop in Ecuador by the ability to generate direct employment and high consumption as customers. Panela is an important organic ingredient in food in Colombia, Peru, Venezuela and Ecuador, it is used for the preparation of Roan melao or honey of panela (a kind of candy), which is the basis of many desserts and traditional sweets, also used for the manufacture of beverages. One of them is the traditional drink of Colombia, Venezuela and Ecuador, called Aguapanela, or "Papelón with Lemon" or Aguadulce (17). The 20 % of the production is destined to the manufacture of panela and the other 80 % is for the production of sugar and ethyl alcohol from sugar cane juice and molasses, respectively. Specifically, in the province of Pastaza, 30 % of sugarcane production is used for hot water, the other 40 % for brown sugar and 30 % for cane fruit; of total production 10 % of waste is maintained due to lack of roads, pests and diseases (17).

Within the existing products and services, food is the most consumed by the population, for that reason, the study of food chains is of high value for the development of modern societies. The purpose of this paper is to assess the level of integration of the food chain of panela in Puyo, Ecuador, chain local or territorial scope. In addition, the panela (raspadura in other contexts), is a traditional product of the Amazon region of Ecuador.

MATERIALS AND METHODS

In order to assess the level of integration, for this work, it is called collaborative planning, the highest link of integration (18) and integration is measured by the level of Collaborative Planning. A diagnostic tool is used to measure the level of collaborative planning (LCP), which consists of a checklist, defined by Sablon (19), research composed of 91 elements, based on the variables defined by VICS[a], are: collaborative planning, collaborative forecasting, collaborative replenishment and collaborative performance. It is valid and reliable by Cronbach's alpha and correlation of total *items*.

Items in some cases are quantitative and other qualitative. The first presented an ordinal scale from one to three. In the research, the median is used. The statistician of central tendency that is equal to the value that divides half the data when they are ordered from highest to lowest; is a value such that its right is 50 % of the data and 5 0% on the left and is preferably used in ordinal scales, for evaluation of the items (20). The latter have a nominal scale, which varies depending on the type of question and the analysis, it is performed based on frequency, percentage value presents; where the analyst interprets the results in relation to their experience and approach to collaborative planning. The process has four steps to assess the level of integration of the supply chain (Figure 1).

In Step 1, the group of specialists in each actor is selected, it is based on the experience of the staff and the influence of their knowledge in decision making of each company or small business.

In Step 2, weight or degree of importance is assigned to each variable by the group of specialists Analytical Method by Hierarchical, measures the relationship among the variables and the intensity of that relationship (8).

In Step 3, the checklist is applied to each of the actors in the chain under study, to evaluate the level of integration in the chain.

In Step 4, the results of the instrument are analyzed through a descriptive statistical study, where the weight of each variable is multiplied by the results of the corresponding items. To obtain the value of the variable results of the weights of the variables for the corresponding items and the total sum of the above findings add, provides the value of collaborative planning level that presents the supply chain.

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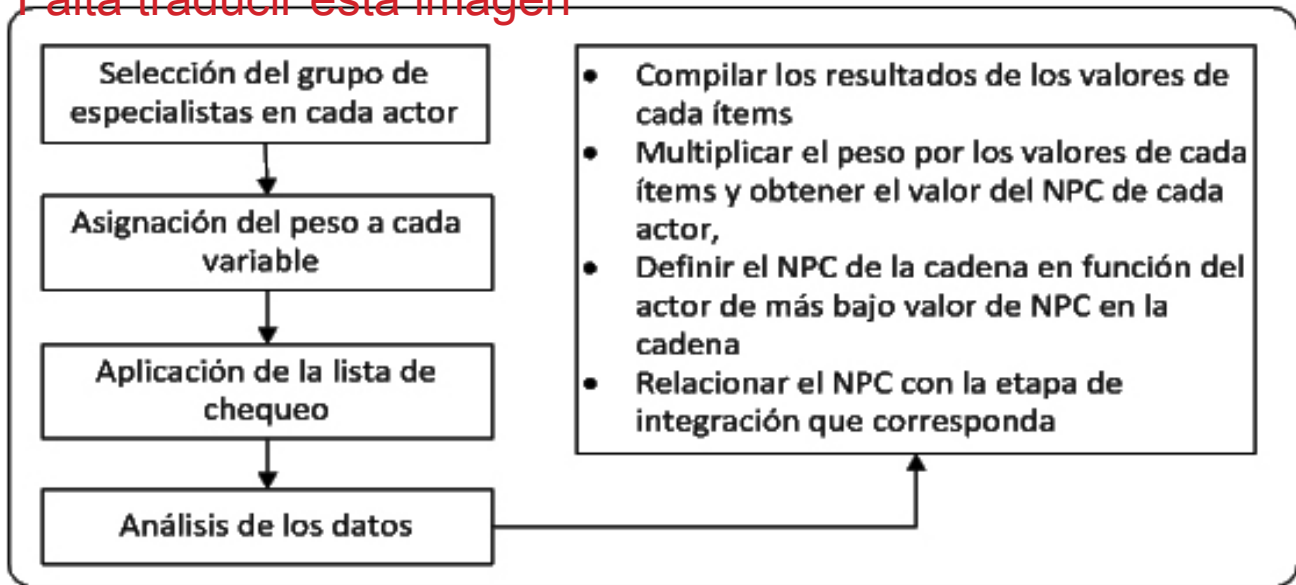
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Figure 1. Procedure for assessing the level of integration in supply chains

If the result is greater than zero and less than or equal to one, "VERY LOW LEVEL ". If it is greater than one and less than or equal to two, "LOW LEVEL". If it is greater than two and less than or equal to three, "standard level" more than three and less than or equal to four, "HIGH LEVEL" and greater than four to less than or equal to five, "VERY HIGH LEVEL".

In order to make possible the study, a computer support tool built through Excel format, with the aim of facilitating the calculation of the LCP in each actor (Figure 2). It has a main menu, from which it accesses the questions in the checklist, the hierarchical analytical method, variables and the final value of the LCP.

It is selected the smallest; the LCP chain is based on the lower value of the indicator in the chain, in correspondence with the weakest link.

The relationship of the integration level and the chain stage and the function of these elements, strategies should follow the same are identified. If the LCP is very low, it is in the assigning step; if the LCP is low it is in a stage of negotiation or association; if the LCP is medium, it is at the stage of cooperation; if the LCP is high it is in coordination and if character is located high in collaboration. As the level of integration increases, the above steps are contained and types of strategies for each stage are defined, in correspondence with the collaborative planning level (Figure 3).

In stage V, coordination is invalidated, if the information is not shared. At level VI, collaboration is invalidated by failing to plan together and have low integration into the supply chain. Therefore, each stage carried predetermination mode associated a type of strategy as the basic or greater in magnitude to implement. However, it is likely that elements associated strategies characteristics of previous stages are still in place. In Levels I, II and III, which contain the same value of the LCP, the type of strategy is defined to follow, depending on the specific characteristics of each stage of integration. Therefore, it is recommended to first apply the LCP and second, determining the type of strategy.

From the above it can also be seen that has a dual character LCP to be diagnostic tool and level meter collaborative planning. First, as a diagnostic tool, even without existing agreements and collaborative planning second, as a level meter collaborative planning, after making the whole business plan.
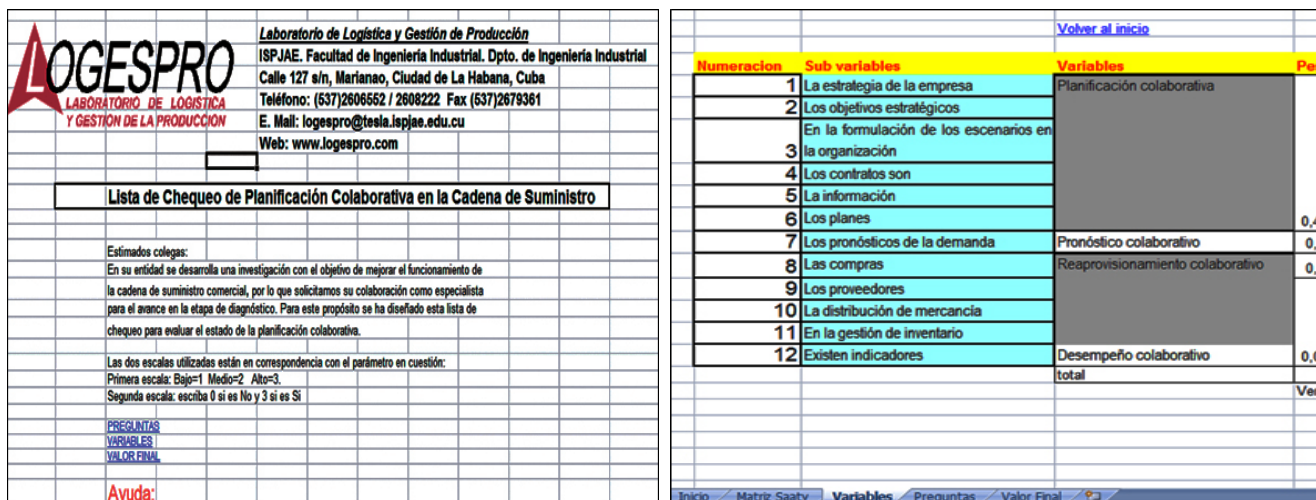
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Figure 2. A computer tool for calculating the LCP

Levels of research	Allocation I	Negotiation II	Association III	Cooperation IV	Coordinator V	Colaboration VI
NPC	1	2	2	3	4	5
Types of strategies	Resource allocation	Discussion focused on leadership in costs, differentiation, focus or niche	Unite assets in critical processes at last only economic or other interest	Long-term contracts	Connection via TIC	IIntegration of the supply chain
		Relationship as opponents		Few suppliers	Share information	Joint Planning
						Share Technology

Source: made myself

Figure 3. Relationship between the LCP and the integration stages

RESULTS

The chain under study presents four links: suppliers, production, sale and the end customer. The eight actors in relation to the four links. The sugarcane varieties produced depending on the concentration and color of the product. Tangible not have trademarks, so that product quality is not guaranteed, containers and packaging are made by hand and because of the high humidity climate products without oxygen are needed, so that no flow bacteria and fungi in the same (Table).

Providers chain study, family cane producers, engaged in planting this in the Tarqui and 17 km section via Araujo. Cane varieties that are harvested are the Lima and crystalline, mainly due to the characteristics of the soil and climate of Puyo.

Some producers are unified Agroindustrial Producers Association Sugarcane and the rest working in family farms craft. Upon completion of the product, panela or scrape, distributed in various vehicles without the basic conditions of transport of food to the outlets of Puyo, Baños and the Central Panelera to consume by customers. In addition, where panela is produced is in the city of Puyo and the city that is known for this product is Baños. Map chain study is performed (Figure 4).

RESULTS LCP IN THE SUPPLY CHAIN OF PANELAS IN PUYO

Checklist to actors in the supply chain is applied, the results of the LCP of each actor in the study (Figure 4) are obtained.

Tabla. Description of SMEs PYMES of panela chain in Puyo

Company name	Sector	Processing time and duration of panela	Cost of the product	Place where the product is sold	Product life cycle
El Vallecito	Services (Feeding)	11 horas	0,9 $/kg	Quito and Ambato	1 month
Agroindustrial association of sugarcane	Services (Feeding)	12 horas	0,96 $/kg	Coca, Lago Agrio, Puyo and Shushufindi	1 month
La Florencia	Services (Feeding)	7 horas	0,7 $/kg	Quito, Baños and Ambato	1 month
Familiar farm 1	Services (Feeding)	10 horas	0,8 $/kg	Puyo and Ambato	3 weeks
Familiar farm 2	Services (Feeding)	11 horas	0,9 $/kg	Baños and Ambato	3 weeks
Familiar farm 3	Services (Feeding)	9 horas	0,9 $/kg	Puyos and Baños	3 weeks
Familiar farm 4	Services (Feeding)	10 horas	0,92 $/kg	Quito, Baños and Ambato	1 month
Familiar farm 5	Services (Feeding)	12 horas	0,92 $/kg	Puyo and Quito	3 weeks

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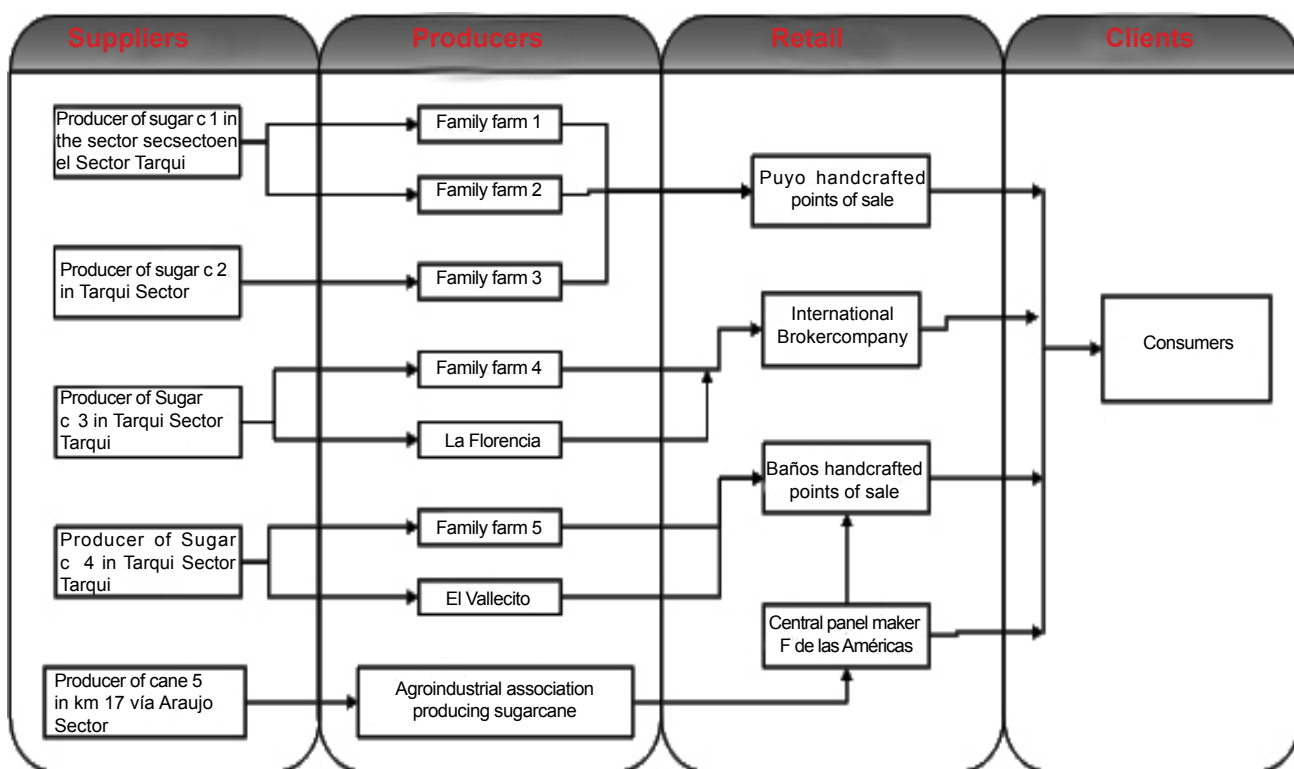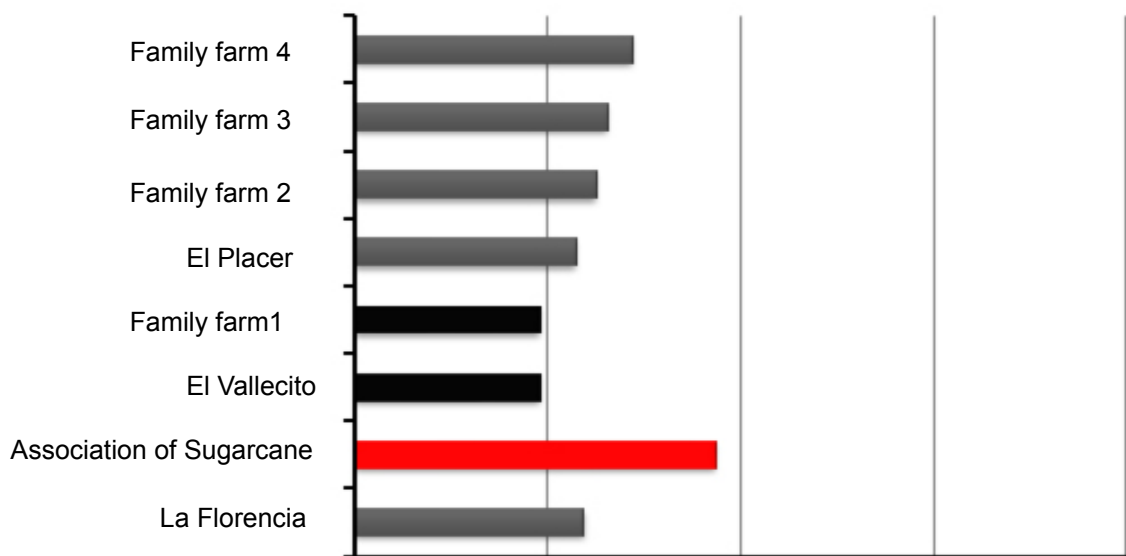

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Figure 4. Map of the supply chain of panela in Puyo

The checklist is valid and reliable, because the Cronbach's alpha has a value of 0,81 (greater than 0,5) and total correlation items is greater than 0,4 in the items.

The lower value of the LCP is the 1,96 of the actors of the family farm 1 and Vallecito, being a "low level"; the highest value of 2,87 LCP is the Agroindustrial Association of Sugarcane being a "standard level". LCP values of all actors in the supply chain demonstrates a "low level" (Figure 5). The black color of the bars, the lowest mean values of the LCP and red the highest value of the LCP in the chain.

The variable most heavily weighted according to the criteria of the actors and the results of the Hierarchy analytical method, is the joint application. The biggest shortcoming is variable collaborative planning, which affects the performance and collaborative forecasting present weaknesses.

By linking the LCP and the integration stage, the chain under study is in the negotiation stage. Therefore, the respective strategies focus on: cost leadership; differentiation; or niche approach and relationship as adversaries (Figure 6). In this particular case, not in the associating step, because not related as any guild.

Source: made by myself

Figure 5. Result of the LCP of each actor in the chain of panela in Puyo

Level of integration	Allocation I	Negociation II	Association III	Cooperation IV	Coordination V	Collaboration VI
NPC	1	2	2	3	4	5
Types of strategies	Resource allocation	Discussion focused on leadership in costs, differentiation, focus or niche	Unite assets in critical processes at last only economic or other interest	Long-term contracts	Conection via TIC	Integration of the supply chain
		Relationship as opponents		Few suppliers	Sharing information	Joint Planning
						Share Technology

Source: made by myself

Figure 6. Selecting the strategy based, in correspondence with the level of integration and LCP

In the case study it suggests that the types of joint strategic objectives focus on enhancing customer satisfaction and are:

Market reach

♦ Market Segment: customer groups relation to a product or service.
♦ Market Breadth: increased market share market.

Competitiveness

♦ Improve the integration of the supply chain with high LCP.

DISCUSSION

With the results analyzed, it is found that collaborative planning in the supply chain of the brown sugar is low and should focus the development of the final product (panela), to influence the customer demand.

To achieve customer satisfaction, the actors in the supply chain of panela must use a tool that enables collaborative planning among all, the whole business plan (Figure 7), because the exchange of information is needed in production and marketing of the product plans between producers. Producers and suppliers know the satisfaction of end customers and thus contribute to improving the quality, quantity and product prices.

In the environment of collaborative planning of a supply chain, an instrument that promotes the common work among actors and define the role of each in the chain, the whole business plan is needed. The whole business plan is an element that provides coordination of collaborative planning in the supply chain, which could be rigged to a virtual enterprise (9), in which the actors would be the partners that make up the supply chain.

CONCLUSIONS

In this paper the level of integration was assessed in the food chain of panela in Ecuador, so it comes to the following conclusions:

♦ Panela is a product of high consumption due to the typical customs of the inhabitants of Puyo and Ecuador in general.
♦ The level of integration of the chain under study is low and variable biggest deficiency is collaborative planning. This, the implementation of a plan of joint venture among microenterprises that make up the chain, depending on the improvement of product quality is necessary and therefore the ultimate customer satisfaction. In addition, the need to strengthen Puyo markets for this product become representation of the city and its residents generate profits.
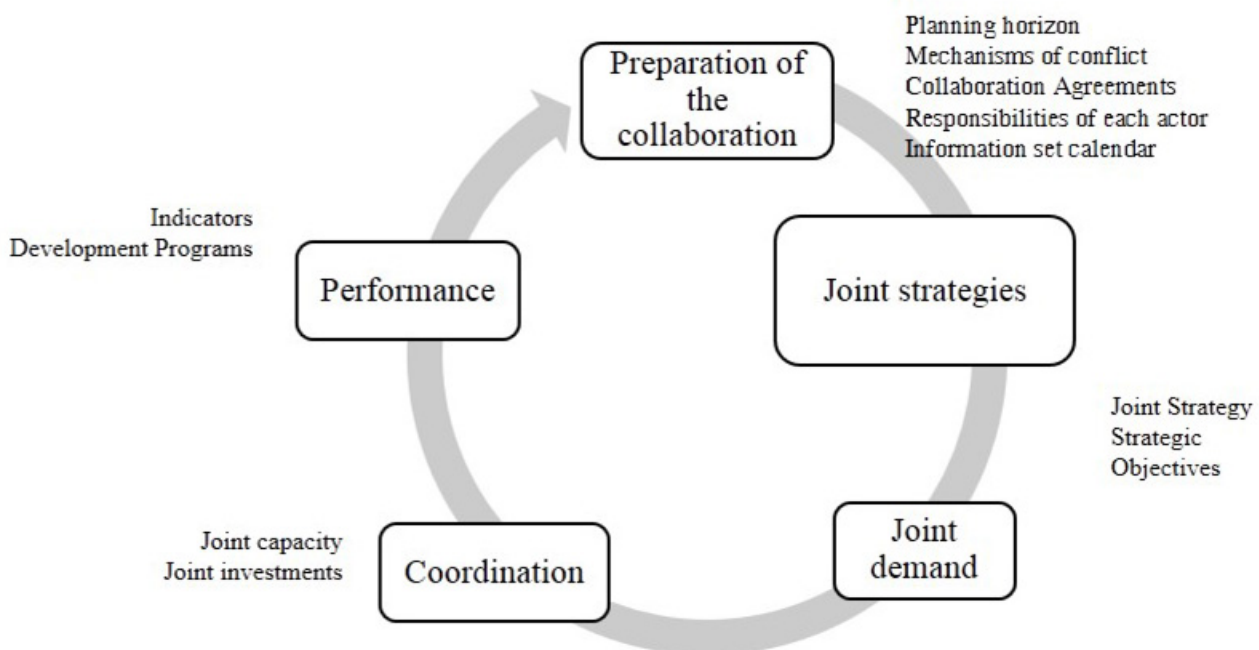
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Figure 7. Proposal of a joint business plan

♦ The main challenge for the development of agrifood chains is the recognition of human potential need for application of the philosophy of networking, for improved levels of customer satisfaction.

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