Associative and productive strategy for the fish farming sector in Cumbal and Potosí, Nariño

RESEARCH ARTICLE

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SUMMARY. Introduction: Fishing and aquaculture support the development of local rural communities in the country as these activities provide economic sustenance. They are vital for the economy of rural farmer and indigenous communities, because they are part of family economies with small- and medium-scale production. **Aims:** To proposed strategies combining mutual cooperation, external visibility, and productive results, which encourage associativity and create an environment that encourages knowledge transfer, fosters social relationships, and improves productivity small and medium trout farmers located in Cumbal and Potosí Nariño. **Methods:** The aforementioned factors were measured in the productive chain's quality and competitiveness. The study adopted a mixed approach comprising collection, analysis, and correlating quantitative and qualitative data in a single study to address the problem statement in a case of the associative and productive strengthening of 40 small and medium trout farmers. **Results and conclusions:** The study found that, as an associative strategy, the strategic direction in the business network provides clear actions for the development as an organization and simultaneously allows to consolidate a method of thinking and feeling as a whole, facilitating the development of the sector as a self-regulated organizational entity that generates actions in the short and medium term to meet its common objectives. This is reflected in the improvement in productivity and standardization of processes and procedures that together contribute to improving the productivity and competitiveness of the rural sector.

Keywords: Fish farming, Associativity, Business Network, productivity, competitiveness.

Estrategia asociativa y productiva para el sector piscícola de Cumbal y Potosí Nariño

RESÚMEN. Introducción: La pesca y la acuicultura apoyan el desarrollo de las comunidades rurales locales en el país, ya que estas actividades proporcionan sustento económico. Son vitales para la economía de los agricultores rurales y las comunidades indígenas, porque son parte de las economías familiares con producción a pequeña y

mediana escala. **Objetivos:** Proponer estrategias que combinen la cooperación mutua, la visibilidad externa y los resultados productivos, que fomenten la asociatividad y creen un ambiente que fomente la transferencia de conocimiento, fomente las relaciones sociales y mejore la productividad de los pequeños y medianos productores de trucha ubicados en Cumbal y Potosí Nariño. **Métodos:** los factores antes mencionados se midieron en la calidad y competitividad de la cadena productiva. El estudio adoptó un enfoque mixto que comprende la recopilación, el análisis y la correlación de datos cuantitativos y cualitativos en un solo estudio para abordar el enunciado del problema en un caso de fortalecimiento asociativo y productivo de 40 pequeños y medianos productores de trucha. **Resultados y conclusiones:** El estudio encontró que, como estrategia asociativa, la dirección estratégica en la red de negocios proporciona acciones claras para el desarrollo como organización y al mismo tiempo permite consolidar un método de pensar y sentir como un todo, facilitando el desarrollo del sector como una entidad organizacional autorregulada que genera acciones a corto y mediano plazo para cumplir con sus objetivos comunes. Esto se refleja en la mejora de la productividad y la estandarización de los procesos y procedimientos que, en conjunto, contribuyen a mejorar la productividad y la competitividad del sector rural.

Palabras claves: Piscicultura, Asociatividad, Red empresarial, productividad, competitividad.

Introduction

Fishing and aquaculture support the development of local rural communities in the country as these activities provide economic sustenance. They are vital for the economy of rural farmer and indigenous communities, because they are part of family economies with small- and medium-scale production.

Productive chains include that of fish farming have been operational in Colombia since several decades. These chains connect producers who form small associations such as Limited Resource Aquacultures (AREL per its acronym in Spanish) and micro and small aquaculture enterprises (MSAEs). In a pyramid, ARELs are the base and include 87.68% of Colombia's fish farmers, who are plagued by low incomes and limited development arising from insufficient technology, administration, market, capital, services and other factors such as access to permits, licenses, road infrastructure and government support. For AREL fish farmers, these limitations affect the agricultural sector's productivity and competitiveness. Therefore, special strategies must be framed to address these limitations (FEDEACUA, 2015).

One of the greatest challenges faced by the various fish farmer organizations is the lack of interaction and communication. This has limited their ability to maintain a sound organizational environment that facilitates cooperation for greater visibility and have options and/or advantages that favor collective where common interests are prioritized over individual interests, thus improving producers' conditions and enabling access to

knowledge, technologies, economic support, among others. Therefore, the present study aims to strengthen the associative and productive components through a mixed research process that addresses the subject.

Consequently, this project proposed strategies combining mutual cooperation, external visibility, and productive results, which encourage associativity and create an environment that encourages knowledge transfer, fosters social relationships, and improves productivity. These factors are measured in the productive chain's quality and competitiveness, which result in economic benefits (Hernandez, 2011).

Materials and Methods

This study adopted a multimethod approach, considering the quantitative and qualitative paradigm, using a nonexperimental design because there was no intentional manipulation of the variables. In other words, the phenomena were analyzed as in their natural context (Hernandez and Fernandez, 2003). Within these types of nonexperimental designs, the study was transactional; thus, data were collected during a predefined time, followed by analysis of the important properties such as people, groups, and communities. The relations and situations generated were subjected to a descriptive–explanatory analysis (Hernández and Collado, 2004). Furthermore, a deductive-inductive method was used. An inference approach based on logic and related to the study of specific events and their fundamental characteristics was adopted as the basis to present an interpretation, image, or faithful representation (description) of the phenomena studied. As regards the methods of information gathering, a document analysis was conducted based on a literature review of the sector and the theoretical framework, which includes studies on associativity, sector assessments, and business networks. In addition, 40 surveys were conducted with 40 trout farmers in Cumbal and Potosí for their assessment and characterization.

Results

Success and critical factors obtained from the external and internal assessments of the fish farming sector

The following are results of the study on the fish farming sector. In terms of the external assessment, the study results are presented based on a literature review on the fishing sector. The information collected was set into POAM and MEFE matrices. With regard to the internal assessment, the survey results and their descriptive analyses by frequency were used, which were systematized with the PMCI and MEFI matrices. External and internal assessments were made through the SWOT and SFAM matrix.

Strategic assessment—external analysis

Information gathered through literature review was placed in threat or opportunity cells, as appropriate. This identification was transferred to the POAM matrix to determine the high-impact variables. The external analysis, consolidated in the Opportunity and Threats Profile in the POAM average, is shown in
(Table 1).

Table 1. "Tool: POAM Profile of opportunities and threats of the environment"

FACTOR	Weight (W) [0 and 1]	Opportunity		Threat		Analysis and interpretation by category
		Rating (R) [1, 2, 3, or 4]	**Weighted score** (W*R)	**Rating (R) [1, 2, 3, or 4]**	**Weighted score** (W*R)	
1. Economic						**0.66**
1. Inflation	0.06	0	0.00	4	0.24	The investment policy is considered an opportunity for the development plans. However, inflation and GDP are a threat given the low competitiveness of small- and medium-sized producers.
3. GDP	0.06	0	0.00	3	0.18	
4. Investment policy	0.06	4	0.24		0.00	
2. Policies						**0.54**
2. Amount of government budgets	0.06	4	0.24		0.00	Government budgets are a substantial element for the development of the sector. Nevertheless, environmental and tax laws affect small producers, which increases operating expenses and possibly limits production in the area of water concessions, given that water use is restricted.
3 Environmental protection laws	0.06	0	0.00	1	0.06	
4. Changes in tax laws	0.06	0	0.00	4	0.24	
3. Social						**0.60**
1. Attitudes towards saving	0.06	4	0.24		0.00	A good attitude towards saving and proper revenue distribution have been observed. However, there are flaws in the subject of social responsibility due to the lack of knowledge of this important issue in the fish farming sector.
2. Revenue distribution	0.06	4	0.24		0.00	
3. Social Responsibility	0.06	0	0.00	2	0.12	
4. Technological						**0.67**
1. Level of technology	0.07	4	0.28		0.00	Regarding the level of technology, at the global level, technological packages and automation processes in the fish sector are being developed, which must be implemented for the development of the Colombian rural sector, to improve the poor flexibility in applying technological processes when implemented.
2. Process flexibility	0.07	0	0.00	1	0.07	
3. Automatization	0.08	4	0.32		0.00	
5. Geographic						**0.8**
1. Location	0.08	4	0.32		0.00	Location and environmental conditions are an opportunity.
2. Environmental	0.08	4	0.32		0.00	

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Table 1 indicates that the fish farming organizations studied have a medium response capacity toward opportunities and threats in the sector. There is a need for better strategies that help in availing the advantage of existing opportunities and minimizing the possible adverse effects of external threats. In addition to leveraging opportunities, it is important prevent external threats that may affect the sector's competitiveness.

For Cumbal and Potosí, aquaculture is an alternative given that the most vulnerable rural communities tend to have a broader range of subsistence strategies, particularly because of their situation of uncertainty. An FAO/World Bank study on farming systems, which was based on 70 crops in the global context, highlighted the following five key factors to counter poverty: intensification, diversification, increase in the asset base, increase in farm revenue, and exit from agriculture (Halwart, Funge-Smith, & Moelh, 2006).

According to Dixon, Gulliver, & Gibbon (2001), within diversification, aquaculture was evaluated as the only and most reliable manner to reduce poverty in rural communities and future generations. They also stated that it is essential to increase the competitiveness of small farms to increase the capacity of small producers in agriculture systems to respond adequately to trade, as well as the opening up of the market and market development. Therefore, the following factors must be included: group training on business, management, and administration techniques; improved technologies for high-value production; reduction of entry barriers for small enterprises; strengthening of partnerships; and facilitating or partially financing rural infrastructure development.

Internal Assessment

A survey on socioeconomic, business, productivity, environmental and commercial information factors was needed for internal assessment of the businesses in the fish farming sector in Cumbal and Potosí. Based on the these factors, their strengths and weaknesses were determined and placed into an internal categorization profile matrix (ICPM), which classifies them as having high, medium, and low impact. The inputs in this matrix generated the high-impact variables weighted in the MEFI matrix, which further determined the degree of internal positioning of the companies in the fish sector (Table 2), adapted from (Serna, 2014) and (Fred, 2013)). Analysis of the internal context shows that the total weighted scored is less than the average (2.5), which implies that fish farmers have serious weaknesses and that it is necessary to create strategies to improve their internal environment. These strategies must determine the direction, route, and target that each producer wants to achieve through the activities of associative fish farming groups in Cumbal and Potosí. The challenges that small producers face are tougher because their activities are part of a changing, ambiguous, and demanding environment in the optimization of the final product. Saz, Gil & Marcuello (2007) stated that in a changing environment, there is a need for competitive advantages and actions that support service with a capacity for early and agile responses to any internal or external problem that may arise.

Table 2. Strategic Diagnosis - Internal Analysis: Organizational Audit

CAPACITY	Weight (W) [0 and 1]	Strengths		Weaknesses		Analysis and interpretation by capacity
		Rating (R) [3 or 4]	Weighted score (W*R)	Rating (R) [1 or 2]	Weighted score (W*R)	
1. Leadership Capacity						**0.11**
1. Corporate image Social Responsibility	0.04		000	1	0.04	With respect to the leadership capability of organizations, corporate image and social responsibility are lacking. This is due to the absence of strategic plans with their corresponding assessment and evaluation of environmental forecasts, which enables organizations to adapt to environmental needs.
2. Use of strategic plans Strategic analysis	0.05		000	1	0.05	
3. Evaluation and forecasts of the environment	0.02		000	1	0.02	
2. Competitive capacity						**0.3**
1. Product strength, quality, exclusiveness	0.04	3	0.12		0.00	There is adequate product strength , quality, exclusivity and loyalty. Customer satisfaction must be improved and there is a weakness in market share especially nationally and internationally.
2. Client loyalty and satisfaction	0.04	3	0.12		0.00	
3. Market share	0.03		000	2	0.06	
3. Financial capacity						**0.2**
1. Access to capital when required	0.05		000	2	0.10	With respect to the financial capacity, there are weaknesses in accessing capital when producers require it. There is also little borrowing capacity and it is very easy to leave the market.
2. Debt capacity utilization	0.05		000	1	0.05	
3. Ease to leave the market	0.05		000	2	0.1	
4. Technological capacity						**1.1**
1. Technical and manufacturing skills	0.20	4	080		0.00	With respect to technological capacity, there is a high level of technical and manufacturing ability given the experience of the fish farmers. However, there is a low capacity for innovation and an inadequate level of technology used in the products and by-products.
2. Innovation capacity	0.10		000	1	0.10	
3. Level of technology used in the products	0.20		000	2	0.40	
5. Capabilities of human talent						**0.3**
1. Academic level of human talent	0.05		000	2	0.10	With respect to human talent, analysis has shown that there is weakness in the academic level of producers,
2. Technical experience	0.05	3	015		0.00	

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Success and critical factors

To identify strategies based on the analysis of success and critical factors, the data from the POAM and MEFE matrices were taken. It was found that the fishing sector is below average in terms of effort, to frame strategies that enable leveraging the opportunities and overcoming external threats, although the total weight of opportunities is greater than the total weighted value of the threats. Furthermore, the ICPM and MEFI matrices were analyzed by evaluating the strengths and weaknesses of the internal context. These matrices revealed a weak internal strategic position and highlighted that their internal forces (strengths) outweigh their weaknesses.

Subsequently, critical factors were established on the basis of strengths, opportunities, weaknesses, and threats, which had a high weighted value. Strategies were formulated to leverage strengths and opportunities to counteract weaknesses and address latent threats in the environment. The strategy formation analytical matrix (SFAM) is outlined as follows:

FO strategies: Strategies applied to a company's internal strengths to leverage the window of external opportunities.
DO Strategies: Strategies aimed at overcoming internal weaknesses by leveraging external opportunities.
FA Strategies: Strategies that leverage the strengths of the business to prevent or mitigate the impact of external threats.
DA Strategies: Defensive tactics that aim to reduce internal weaknesses and prevent threats to the environment.

The strategies obtained in this matrix will act as inputs to form the network's objectives (Table 3).

Table 3. Tool: MPC Competitive Profile Matrix. Fred (2013, p.83)

Key Success Factor (KSF)	Weight (W) [0 and 1]	Rating (R) [1, 2, 3, or 4]	Weighted score (W*R)	Analysis and interpretation by category
Clients				
Corporate image	0.08	1	0.08	Corporate image needs to be improved, in addition to customer loyalty and product access to improve the client factor.
Client loyalty	0.08	3	0.24	
Product accessibility	0.08	2	0.16	
Market				
Price competitiveness	0.08	2	0.16	While there is sound price competitiveness, market share and strategic partnerships, they need to be strengthened to improve market conditions.
Market share	0.07	3	0.21	
Strategic Partnerships	0.07	3	0.21	
Product				
Product and service quality	0.10	3	0.30	Product and service quality, process efficiency and presentation according to needs is a challenge that fish farmers must address and improve so that their product meets the needs of the sector.
Process efficiency	0.10	3	0.30	
Presentation according to needs	0.10	2	0.20	
Technology				
Technical and manufacturing skills	0.08	1	0.08	The technology component must be improved as it requires increasing technical and
Research and innovation	0.08	1	0.08	
Level of technology used in the products	0.08	2	0.16	

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Based on the internal and external analyses of the fish farming sector in Cumbal and Potosí, an improvement plan was framed (Table 4), which further led to strategic challenges (Table 5).

Table 4. "Phase: Strategic design Tool: DOFA matrix" Serna (2014, p.187) and Fred (2013, p.177)

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Table 5. Strategic challenges

Strategic challenges:
R1 (E1,E3,E4,E7,E9): Improve the technological and innovative processes of the productive systems that improve the business' productivity.
R3 (E2, E6, E8,E10,E12): Improve market share, increase revenue and investment in productive systems.
R3 (E2, E6, E8,E10,E12): Form strategic partnerships that enable improved productivity and market positioning.

Administrative processes with their respective strategic lines of actions to structure the business network

To overcome the challenges, administrative processes with strategic actions that actively involve the participating actors, with their respective strengths, actions, and impact expectations are necessary. These administrative processes facilitate the strategic actions of the business network and its tactical lines of action to be implemented from the business network's coordinating unit, which is considered the main engine that manages and streamlines the strategic challenges, which requires coordination of the horizontal and vertical network.

The network is horizontal when net profits are generated, which are directly allocated to different companies that compete within the same subsector or link in the production chain. This leads to greater competition and expands markets, coverage, positioning, and negotiating power through the joint actions between companies with relatively homogeneous capital, qualities, processes, and similar products. The network is vertical when net profits are directly allocated among companies and institutions on different links of the value chain, such as from supplier/distributor to many distributors/producers. The processes, products, and qualities are dissimilar (there is a need for collaboration between companies with uniformity and heterogeneous capital) (Rosales R., 1997). The following are the main guidelines to generate an organizational culture and strategic direction.

Proposing a management system that improves the business network's processes and procedures

Implementation Plan

Once the administrative processes and strategic direction were identified, a plan for implementation was created based on Serna (2014, p.254) to optimize the processes and results of developing the network with management systems through a holistic approach that combines quality and sustainability in one system as an instrument to maintain the status quo, manage change and improvement, and provide added value to the business network. This enables processes to be run effectively and efficiently, thus promoting continuous improvement and the opportunity to optimize processes and procedures according to stakeholder needs and improving the business network's environment that bolsters the sector's competitiveness.

To create an Implementation plan, it was necessary to identify possible pilot projects to develop the network, highlighting scopes, responsible parties, indicators, and an implementation timetable to have a clearer outlook and methodologies, and thus, meet the proposed objectives. Furthermore, activities were carried out to socialize and coordinate progress with communities through the use of qualitative and quantitative management indicators. (Table 6) outlines the strategic projects of the fish farmers network with their indicators corresponding to the framework project, which is titled, "Innovation in associative production, products and work to strengthen competitiveness and sustainable management of water resources for trout fish farmers in the department of Nariño through the business network."

Tabla 6. Herramienta: Escala cualitativa calificación de desempeño

Qualitative Scale - Performance Rating	
Rating	**Range**
Excellent	If the deviation is positive (advanced).
Good	If the deviation is equal to 0% (on time).
Satisfactory	If the deviation is between 0.1% and 10% (minimal deviation).
Unsatisfactory	If the deviation is between 11% and 25% (medium deviation).
Critical	If the deviation is greater than 25% (large deviation).

Evaluation

Evaluation and monitoring of the implementation plan is needed by creating a chart that measures the execution of the strategic plans. This chart will establish the compliance measurement frequency for an indicator, the measurement period for actions developed by each strategic project, the expected performance index for the project with its corresponding ratings of ***excellent, good, regular, and critically inefficient***. This analyzes the measurement and establishes the proposed actions, which can be preventive or corrective. (Table 8) provides an example of how strategic projects should be evaluated, for which (Table 7) is used.

Table 7. Tool: Dashboard - Resume of the indicator "Serna (2014, p.295) and Fred (2013, Cap.9)"

Strategic project	Responsible area	Project Duration (Months)	Overall Objective	Phase/macro-activities	SMART Objectives for each phase	Indicator	Deliverable/Expected outcome	Total budget amount	Risks (+,-)	Complementary information
Strengthen technological and innovative processes of the productive systems that improve the company's productivity.	Production department of the business network's coordinating unit	6	Incorporate science, technology and innovation in productive processes	Improve punctuality	Incorporate new processes and procedures in each production phase.	Number of processes implemented	Kilos produced during implementation	5,000,000,000.00	Obsolete infrastructure that must be improved, increasing investment, environmental changes that prevent a constant, permanent and efficient production, producers lose interest in cash counterparts.	Some productive units need to improve infrastructure, before starting with the improvement in productivity.
				Improve harvesting and post-harvesting processes	Standardize harvesting and post-harvesting processes to improve product quality and competitiveness.	Quality certification of processing plants	Quality certificate			
				Generate added value	Research by-products that are harvested and generate new products.	New products obtained	Products with added value obtained			
Increase market share, increasing revenue and investment in productive systems.	Marketing department of the business network's coordinating unit	6	Propose a marketing plan to improve commercialization.	Promote the product	Increase product promotion in national and international markets	Number of promotion strategies implemented.	Number of strategies implemented.	200,000,000.00	Taxes and permits with elevated costs that prevent product marketing, client disloyalty, non-compliance with trade agreements by the parties.	A marketing plan that is directly related to production is required to avoid delivery setbacks.
				Improve product distribution	Improve product placement by improving product distribution.	Place in the market and product distribution.	Product placement			
				Identify new marketing channels	Identify new possible marketing channels in national and international markets.	Number of markets available for commercialization	Established sales contracts			
Incentivize the formation of strategic partnerships that	Associativity department of the	6	Structure the network of partners to improve products'	Identification of actors	Identify partners in the horizontal network	Number of partners identified	List of actors	10,000,000.	Disinterest by actors in participati	Generate permanent strategies to keep predisposit
				Form partnerships	Establish agreements	Agreements	Agreements			

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Table 8. Phase: Implementation. Tool: Implementation plan. Serna (2014, p.254)

Proyecto estratégico	Objetivo general	Fase/ Macroactividades	Objetivo de cada fase SMART	Indicador	Frecuencia de medición	Periodo de medición	Índice de desempeño esperado	Índice de desempeño alcanzado	Índice de desempeño del proyecto	Calificación de desempeño (E/B/R/I/C)	Análisis de la medición	Acciones a seguir
Fortalecer los procesos tecnologicos y de innovacion de los sistemas productivos que mejore la productividad de la empresa	Incorporar ciencia, tecnologia e innovación en los procesos productivos	Mejorar la productividad	Incorporar nuevos procesos y procedimientos en cada una de las fases de producción	Numero de procesos implementados	anual	31-dic	Al cerrar la primera fase se espera ejecutar el 30% del cronograma	30	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua
		Mejorar los procesos de cosecha y pos cosecha	Estandarizar los procesos de cosecha y pos cosecha mejorando la calidad y competitividad del producto	certificación de calidad de plantad de proceso	anual	31-dic	Al cerrar la segunda fase se espera ejecutar el 30% del cronograma	30	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua
		Generar valor agregado	Investigar los subproductos que se desechan y generar nuevos productos	nuevos productos obtenidos	anual	31-dic	Al cerrar la tercera fase se espera ejecutar el 40% del cronograma	40	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua
Incrementar la participación en el mercado, incrementando los ingresos y la inversión en los sistemas productivos	Proponer un plan de marketing para mejorar la comercialización	Promocionar el producto	Incrementar la promoción del producto en el mercado nacional e internacional	cantidad de estrategias de promoción implementadas	anual	31-dic	Al cerrar la primera fase se espera ejecutar el 30% del cronograma	30	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua
		Mejorar la distribución del producto	Mejorar la plaza del producto mejorando la distribución del mismo	Lugar para comercializar y distribuir el producto	anual	31-dic	Al cerrar la primera fase se espera ejecutar el 30% del cronograma	30	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua
		Identificar nuevos canales de comercialización	Identificar nuevas posibilidades de comercialización en el mercado nacional e internacional	número de mercados disponibles para la comercialización	anual	31-dic	Al cerrar la primera fase se espera ejecutar el 40% del cronograma	40	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua
Incentivar la formación de alianzas estratégicas que permitan una mejor productividad y posicionamiento en el mercado	Estructurar la red de aliados que permita mejorar la productividad y comercialización de los productos	Identificación de actores	Identificar los aliados de la red horizontal	Numero de aliados identificados	anual	31-dic	Al cerrar la primera fase se espera ejecutar el 30% del cronograma	30	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua
		Realizar alianzas entre actores	establecer convenios y alianzas estratégicas	convenios legalmente constituidos	anual	31-dic	Al cerrar la primera fase se espera ejecutar el 30% del cronograma	30	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua
		concretar los convenios	Realizar acciones con los aliados	acciones desarrolladas con los actores	anual	31-dic	Al cerrar la primera fase se espera ejecutar el 30% del cronograma	30	100	Excelente	Se está cumpliendo con los objetivos del proyecto	Continuar con los procesos y mantener la mejora continua

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Success and critical factors obtained from the internal and external assessment of the fish farming sector

According to the index of departmental competitiveness in Colombia, Nariño, despite being a department with great diversity and natural wealth, along with Casanare, Cesar, and Cauca, ranks among the lowest at the national level. It ranks between 18 and 29, according to the Colombian department competitiveness scale. This same index defines the department of Nariño's profile as low level, with nonconsolidated progress and average heterogeneity among the dimensions of competitiveness (CEPAL, 2014).

According to the third agriculture census, in the department of Nariño, there are 1,285 productive agriculture units (PAUs) with fish farming activity, representing 5.15% of the national total. In addition, there are 17,621 productive agriculture units with fishing activity, which represent 17.3% of the total national fishing activity. Cumbal has 150 PAUs with aquaculture activities, 3 of which are located in Potosí. The municipalities of Cumbal and Potosí are part of the 64 municipalities of Nariño. According to 2017 population projections and estimates by the DANE (2014), the municipality of Cumbal has 30,274 inhabitants recognized within an indigenous ethnic group, representing 99.97% of the population. The total area of the municipality of Cumbal is 63,263 Has; of which, 9174 Has are used for agriculture. There are 6,497 productive agricultural units in the municipality of Cumbal; of which, 2,589 are used for subsistence farming. The total area of the municipality of Potosí is 1,425 Has; of which, 568 Has are used for agriculture. Cumbal's estimated and projected population for 2017 is 9,780 inhabitants; 98.3% of which are indigenous. There are 975 productive agricultural units in the municipality of Cumbal; 656 of which are primarily used for subsistence farming.

While the fish farming activity of the municipalities of Cumbal and Potosí exists since several years, it has not seen sustained growth, limited mostly to subsistence production and a low product surplus percentage for trade. The limited growth is because of the lack of an organization of small producers, limited knowledge of regulations within associative organizations, scant community commitment, scarce technical advice, few opportunities to

access credit, and state abandonment, which led to micro and family businesses working independently and disjointedly and with fierce competition among them. This was exacerbated by limited financing and investment made improve the administrative, technological, industrialization, and value-added generation components, resulting in a weak internal strategic position as seen in the competitiveness indices described earlier.

According to the external assessment, there are limiting factors in terms of budget and lack of ease of access to financing and credit to incentivize technological development. Moreover, there is sparse cross-discipline staff to address these types of processes. This leads to low cohesion and a weak chain link structure with incipient development of supplier networks of equipment, inputs, and services, as well as paralysis of the commercial structure. Furthermore, there is a low agro-industrial development with deficiencies in productivity and specialization in productive processes. The sector has experienced public and private institutional atomization, and weak control in monitoring this activity. In addition to a low institutional capacity for technical assistance and transferring technology, this resulted in poor competitiveness and weak national production projections. This is evident in the internal assessment in which 70% of those surveyed receive technical assistance through SENA, while 30% do not. However, this assistance is not long term, which highlights the need to increase the number of trained staff to improve the productive, economic, and financial variables in the municipalities studied. In comparison to the competitors, those who do not receive technical assistance are at a disadvantage because they do not incorporate technical, productive, and organizational quality processes that aid the activity's profitability and sustainability over time.

The internal analysis was based on the analysis of the productive system to develop preventive and corrective actions to improve the sector's productivity and competitiveness. Therefore, past studies on the physical, chemical, productive, health, sociocultural, environmental, and commercial factors were analyzed along with that of the fish farmers. With the study results, further study on the activity's potentialities is recommended, such as the topography of the land, climate, the availability of water resources, labor, among others, in addition to the productive, competitive, and environmental management to train, create measures, and monitor controls in terms of productive, cultural, normative, political-administrative, and institutional aspects at the national level to ensure the activity's permanence in the future. This contributes to not only the social, economic, and environmental setting of the population, but also the activity's sustainable production over time, developing under the appropriate criteria and techniques, without ceasing to be economically viable and socially acceptable. This facilitates interactions between producers within the various groups and two-way feedback with interinstitutional entities that enable collaboration for benefits that promote local and regional development, as well as visibility for the sector. With the results of the internal assessment, producers were trained on subjects that were developed in section 4 of this report.

A management system that improves the business network's processes and procedures

The problem or need was identified once the external and internal assessments of the fish farmers and their context had been analyzed. Through a participatory assessment with the

help of a facilitator, in this case, the group of researchers, the participants mediated the community's problems and prioritized a "root production problem" that, when overcome, could help resolve other related difficulties.

This process showed that the root problem must be identified through simple and illustrative tools that identify weaknesses, opportunities, strengths, and threats, enabling participants to reflexively appropriate the problem under discussion. The root problems identified were low productivity, inefficient marketing, and inadequate creation of strategic partnerships, which hinders rural organizations' access to science, technology, and innovation. Therefore, change could be brought about by strengthening the business network through strategic direction, which would lead to benefits that would not be achieved if they were isolated and disjointed, such as improved productivity and competitiveness. According to Machado (2009), for a productive transformation in local rural areas, different actors must involve in diversifying productive and revenue-generating activities, strengthened by social organization and political participation that enables technological developments amidst cultural diversity. Easy availability of raw materials, increased bargaining power with suppliers, boosting productivity, and a high value-added product are some of the advantages of the process (Ortega Salas A. , 2014)

Hence, meetings were scheduled to reinforce the shared vision of the association and its business network, using strategies such as video testimonies from participants in similar successful as well as unsuccessful experiences. This is interesting because it promotes networking by exchange of knowledge and information, thus strengthening cooperation within and between diverse organizations, understanding that associativity is an adaptation reaction or mechanism to survive or benefit from opportunities in a specific competitive environment. In these meetings, the corresponding analysis and discussion of the assessments were carried out, highlighting the importance of cooperation and articulation of efforts between companies, as it can effectively contribute to solving problems and addressing weaknesses. Accordingly, 100% of the trained fish farmers were able to integrate into the business network. However, it is necessary to maintain their interest and motivation in the long term. In this regard, the Commission for the Promotion of Small and Medium Enterprises (2005) suggested that seeking common benefits at lower costs is important to reduce uncertainty and address the inherent weaknesses of micro-enterprises.

The possible projects that could be implemented for improvement were discussed. Therefore, analysis and discussion of the internal and external assessments of the sector studied; it was important to identify possible organizational and technological projects; highlight scopes, responsible parties, indicators, and an implementation schedule for a clear outlook and methodologies that meet the objectives. As a result, a project titled "Innovation in the associative production, products and work to strengthen competitiveness and sustainable management of a water resource for trout fish farmers in the department of Nariño through a business network" was created. This project was presented in light of the departmental plans for science, technology, and innovation. This project is developed with the involvement of stakeholders in the horizontal and vertical networks, who contribute their knowledge to structure it. Pilot projects that are easy to implement and that provide tangible results to demonstrate the advantages of their outcomes and to motivate the continuous integration of

the network were proposed.

Strengthening the management of the business network

A coordinating unit to consolidate the development of the business network was proposed. This unit seeks strategies to provide advice and technical assistance, as well as to coordinate support from external consultants who can provide the necessary support to facilitate associativity and joint work. The coordinating unit will consist of professionals, whose main objective would be to create bonds of trust between the companies that are part of the network. If there is no trust, a committed relationship of cooperation cannot be created. Micro-entrepreneurs must have trust in the capacity and commitment while also favor processes that result in economic benefits, knowledge, and technology, which are key items of interest to entrepreneurs. Accordingly, the work of the unit coordinator is critical. The objectives of the coordinating unit are as follows: eliminate all obstacles in the creation of the network; promote and guide the process of building the network; promote the rapid learning of network processes; and foster knowledge and application of the network's strategic direction (Ortega-Salas & Belalacazar-Belalcazar, 2016).

Currently, the coordinating unit of the business network is being established. Researchers and universities coordinate the activities through the research study, "Associative, productive and administrative strengthening of small and medium fish farmers in Cumbal and Potosí, through a business network." This has enabled fish farmers to stay united, receive technical assistance through knowledge transfer, and structure innovation projects that will enable future access to State resources and international cooperation. When fish farmers gain experience and organize themselves as a legally constituted business network, they are expected to coordinate exchange between organizations of producers, customers, operators, suppliers, and public and private entities that support the development of the sector through their social purpose. This optimizes the planning capacity, diversification, and improvement of services of every stakeholder.

In the final proposal for associative cooperation for innovation, it is necessary to establish a time line for the development of projects to be implemented and prioritized. Developing this step is intended to move forward with the network's operational actions. Therefore, a schedule of activities was drawn up with the corresponding responsible parties; indicators; duties; and short-, medium-, and long-term actions in accordance with the associative model, the needs of producers, and the proposal discussion held.

Improving fish farmers' productive processes through training

To empower fish farmers, it is necessary to strengthen their predisposition toward associativity, such as commitment, cooperation, knowledge, technology, economic benefits, and trust (Arias et al., 2006). Therefore, it is necessary to adopt lucid-pedagogical strategies to have a significant impact on these factors (group activities, games, mimic exercises, billboards, and other actions that enable fish farmers to be more productive and competitive), and thus establish trust, dialogue, cooperation, interest, solidarity, respect, leadership, and creativity. Likewise, they have been learning some of the business and market processes, as well modernizing their information and communication technologies.

In short, it can be affirmed that the lucid-pedagogical activities have a positive impact on the predisposition factors toward associativity, given that all of the fish farmers decided to actively participate in the associative process to generate social capital and promote sustainable development in the region (Ortega Salas A. B., 2017).

These actions strengthen rural social innovation processes by improving interrelationships among their main stakeholders and contribute to acquiring new productive abilities to meet demand with strategic knowledge and development of rural institutional structures for innovation, with an emphasis on small-scale production. In the long term, this will aid the development of services market, management of business plans for every productive project, emergence of supply and demand coordinators, and the drive for innovation to be institutionalized. However, to achieve this, it is necessary to strengthen the human component with acceptable acquired learning and used within the set of experiences that currently form the platform of skills and competencies of an innovation system based on trust, commitment, teamwork, and other factors that favor the growth of innovation. It also requires the expansion of successful local innovation on a larger scale, in terms of spaces or territories, but it is necessary to develop the learning capacities of productive organizations to innovate through acquiring and using available knowledge, managing their particular interests through the collective's common purposes to establish priority agendas, and thus meet the goals and objectives of the business network with public and private institutional support (Paz & Hernández, 2013).

With respect to the productive component, it has been suggested that technical team in the business network has the necessary knowledge to promote and advice regarding the associative endeavors through the transfer of science, technology, and innovation, which is challenging in the absence of the producers who are not associated (Alonso, 2000). Likewise, they must be capable of assessing specific requirements to reach successful cooperative agreements through strategic partnerships with organizations that work complementarily to achieve a common objective. Therefore, important agreements or conventions for production, distribution, and commercialization must be framed (Reyes, 2007).

Trout farmers have a weak strategic position within their business units given the many productive, commercial, environmental, financial, and administrative factors that must be improved so that their productive activity is comprehensively geared toward innovation. Therefore, the following strategies have been proposed, which are based on the analysis of internal and external factors, as well as the active participation of the beneficiaries:

(i) Create business synergies with universities, enabling the transfer of knowledge and interrelationships among various actors to access competitive and innovative settings in different scenarios and various alternatives with attractive markets that generate knowledge and development.
(ii) Maintain an innovative mindset that is continuously committed to the demands of the network, sustaining the comprehensiveness of the concept of human talent with the attitudes, behavior, capacities, knowledge, experiences, and skills with which each member must work.

(iii) Contribute to the work in the network, enabling the acquisition of knowledge and technology, which is possible by fostering relationships with a high level of synergy and complementarity among entities. This enables training spaces and creates new forms of production and access to technologies that lead to product promotion, which in turn lead to cost reductions due to the proper processing of the product, along with greater efficiency and higher quality.

(iv) Improve the sector's performance, quality, and positioning with a differentiated offer and greater added value coming from product and process improvements that facilitate standards certifications for new markets, develop brands, and strengthen the distribution logistics of each network member.

(v) Promote the use of ICTs in products and incorporate technology and innovative tools in productive and administrative processes.

(vi) Involve producers in SENA and university training programs to improve production systems, administration, and the environment by implementing new techniques aimed at increasing productivity under conditions of sustainability over time, and thus generate technology transfer, as well as research and innovation processes that facilitate access to financing.

(vii) Create new products through subproducts such as entrails, scales, and fins, while also generating new elements from trout meat such as essential fatty acids, elastin collagen, among others.

(viii) Use new elements to build infrastructure that is more accessible to producers and in harmony with the environment.

(ix) Frame strategies for the operational monitoring of the associative model focused on the business network, under the responsibility of the network's manager-administrator through the use of qualitative and quantitative management indicators.

(x) To verify the proposed model, a focus group with 10 regional experts in the subject of fish farming has been recommended. They will explain the model and monitor and evaluate the process for development. As regards resource allocation, fish farmers must be able to access resources. The money raised will be used to promote the product, support project implementation, and raise awareness of the objectives set for the sector and stakeholders with the goal of collaborating to achieve them.

Conclusions

The business network in the fish farming sector is considered an associative strategy that enables cooperation among micro-enterprises that are voluntarily affiliated while maintaining their legal independence, which seeks to resolve common problems and generate individual and collective benefits with competitive advantages that could not be achieved individually.

It is necessary to maintain continued coordination between universities, businesses, and the state through ties of cooperation, trust, and teamwork, which contributes to the collective efficiency that enable producers to apply knowledge and technology. This will generate equity in the economic benefits and improve the life conditions of the people dedicated to this activity.

Once the rural innovation processes are consolidated, it is necessary to promote the business network in public and private organizations to access different policies and programs for benefits and greater positioning in the agricultural sector.

In the external assessment, little effort was seen to follow the strategies to leverage the opportunities and prevent external threats. Therefore, it is necessary to create strategies that improve this scenario for producers to be more competitive.

The internal analysis of the sector studied reveals that the participating organizations have a weak strategic position to strengthen their capabilities and reduce their weaknesses. This is evident in the business, productive, environmental, and commercial contexts.

The individual factors influencing the predisposition of fish farmers toward the business association, from the most to the least important, are the following: cooperation, trust, knowledge and technology, commitment, and economic benefits; which must be strengthened for the associative model to be successful.

The best development alternative for medium and small companies in this sector is through associativity, in which groups of companies form business networks to avail benefits that cannot be obtained individually.

The great challenge of the business network is to adapt the integration institutionalism according to the demands of local, regional, and national contexts, to the accumulated experience and the possibilities of each subregional scheme. Furthermore, achieving the social and political drive that stimulates the convergence and viability of the processes is a challenge.

Recommendations

It is necessary to continue to strengthen producers' associativity, by continuously building on the business network's processes targeting associativity predisposition factors in terms of trust, commitment, leadership, and teamwork. Projects that improve infrastructure, production, and innovation, thus increasing their productivity and competitiveness, are necessary.

It is necessary to provide ongoing technical assistance in the productive units to improve the productive capacities of the fish farmers.

Information on the sector needs to be kept current to enable government entities to manage and provide current statistics.

Encourage cooperation, knowledge, technology, economic benefits, trust, and commitment in the business network, as predisposition factors for producers to stay associated.

Promote market studies on consumer preferences regarding trout in order to develop marketing strategies for the product and training for new markets.

Seek cooperation with other countries to incentivize the exchange of ideas and new techniques developed for fish farming productivity.

The state must increase promotion of the sector to increase consumption in internal and external markets.

Create special accreditation granted by the association of trout exporters to maintain adequate quality standards.

The state should create a fund that facilitates SMEs access to lines of credit. Likewise, a database must be created of SMEs that have good credit to facilitate their access to financing.

Establish the granting of tax incentives to the sector by law, facilitating the supply of raw materials.

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