ANALYSIS OF THE MARINE SHRIMP FARM PRODUCTION CHAIN IN RIO GRANDE DO SUL STATE[1]

Rodrigo Randow de Freitas[2]*, Nietzsche Gschwendtner Martins[2], Luís Henrique da Silva Poersch[3]

[2]Universidade Federal do Espírito Santo (UFES), Centro Universitário Norte do Espírito Santo, Departamento de Engenharias e Tecnologia (DETEC), Laboratório de Gestão Costeira, Aquicultura e Pesca (LGCap), São Mateus, ES, Brasil.
[3]Universidade Federal do Rio Grande (FURG), Instituto de Oceanografia, Rio Grande, RS, Brasil.
*Corresponding author: digorandow@gmail.com

ABSTRACT: This study aims to identify, describe, and analyze the main links of the marine shrimp culture production chain in the extreme south of Brazil, specifically in the Rio Grande and São José do Norte municipalities, Rio Grande do Sul state. The research was carried out through prior bibliographic, *in loco* research and the application of interviews and questionnaires to identify the entire local productive process from the inputs needed for production to the arrival at the final consumer. The results indicate that the production chain requires actions in the process until the product's final commercialization. Even as a growing market in Brazil, more investments, better support from the Government for the installation of new farmers, a reduction of bureaucracy in public agencies, training of actors involved in production, and some other points identified in this study can help decision makers, inherent to the activity, to establish sustainable production strategies aimed at lasting and full development of local shrimp production.

Key words: aquaculture, balanced scorecard, *Litpenaeus vananamei*, stakeholders, supply chain, SWOT.

ANÁLISE DA CADEIA PRODUTIVA DA CULTURA DE CAMARÃO MARINHO NO SUL DO BRASIL

RESUMO: Este estudo tem como objetivo identificar, descrever e analisar os principais elos da cadeia produtiva do camarão marinho no extremo sul do Brasil, especificamente nas cidades de Rio Grande e São José do Norte, estado do Rio Grande do Sul. A pesquisa foi realizada por meio de uma revisão bibliográfica prévia, pesquisa *in loco* e aplicação de entrevistas e questionários para identificar todo o processo produtivo local a partir dos insumos necessários para a produção até a chegada ao consumidor final. Os resultados indicam que a cadeia produtiva requer ações desde o processo até a comercialização final do produto. Mesmo com um mercado em crescimento no Brasil, mais investimentos, mais apoio do Governo para a instalação de novos agricultores, a redução da burocracia em órgãos públicos, o treinamento de atores envolvidos na produção, e alguns outros pontos identificados neste estudo podem ajudar os tomadores de decisão, inerente à atividade, a estabelecerem estratégias de produção sustentáveis que visam um desenvolvimento da produção local de camarão duradouro e completo.

Palavras-chave: aquicultura, balanced scorecard, *Litpenaeus vananamei*, stakeholders, cadeia de suprimentos, SWOT.

INTRODUCTION

The management of supply chains can be characterized as the effort involved in the production and distribution of a product from the producer to the final consumer (HARLAND, 1996; LARSON and ROGERS, 1998; CASTRO, 2001; CASTRO *et al.*, 2002). Added to this is the integration of the links in this chain to meet the needs and expectations of the final consumers and add value to the products (LARSON and ROGERS, 1998; NEVES *et al.*, 1999; ROBINSON and MALHOTRA, 2005). Other definitions emphasize that the supply chain can assume the role of cooperation between suppliers, buyers, and service providers; furthermore, it can consider the behavior between the links, for example, their conflicts of interest (LARSON and ROGERS, 1998; NEVES *et al.*, 2002; FIALA, 2005).

Therefore, the chain involves the coordination, collaboration, and confidence in the activities within the links that comprise it, from the production inputs, processing, storage, and distribution to the commercialization, aiming to add value and serve the final consumer in the best way and profitably for all who participate (LARSON and ROGERS, 1998; BRISOLA and OLIVEIRA, 2000; CASTRO, 2000; FREITAS FILHO *et al.*, 2000; HOFFMANN *et al.*, 2004; KANNAN and TAN, 2005; ROBINSON and MALHOTRA, 2005).

With the objective of bringing a better product to the customer and achieving productive efficiency, the studies about supply chains aim to transform them into efficient and productive supply chains, in the face of the difficulties imposed by increasingly globalized and competitive business transactions (SOUSA JÚNIOR *et al.*, 2004). The studies aim, among other functions, to analyze the structures, such as the size, the joints between the links, the level of competition, and the competitive advantages that can be improved and/or generated. New demands arise with the evolution of the activities; thus, it is necessary to develop structural diagnostics with the aim of guiding the future decision making, based on present scenarios (prospective analysis) (CASTRO, 2000; FREITAS FILHO *et al.*, 2000; CASTRO, 2001; CASTRO *et al.*, 2002; CARVALHO, 2003; HOFFMANN *et al.*, 2004).

In relation to the fish supply chain, Brazil has experienced an increase in the total production of fish, crustaceans, mollusks, and others by capture and aquaculture in Brazil, which puts the country among the top 15 world leading producers (FAO, 2012; FAO, 2014). Moreover, this chain is a vital source of food, employment, recreation, trade, and economic wellness for people throughout the planet, both for present and for future generations.

Thus, assuming the importance of improving the management of the aquaculture production chain in our country and considering the lack of accurate information about the relationships between the actors, a fact that contributes, in some cases, to competitive inertia and incomplete development of the activity, the present study aims to contribute to the identification and description of the productive chain of marine shrimp culture in the southern state Rio Grande do Sul (the southern portion of the Lagoa dos Patos), seeking to generate information, through a strategic map of the BSC (balanced scorecard) methodology, to contribute to overcoming the possible obstacles and maximizing the existing and untapped potential.

MATERIAL AND METHODS

The study was conducted in the state of Rio Grande do Sul, more specifically in the municipalities of São José do Norte and Rio Grande (32º00′S 52º00′W). Lagoa dos Patos is the main water body near the study area and is the largest lagoon in Brazil, with an area of 10,360 square kilometers (RIBEIRO, 2008). Because of the wide variation in salinity resulting from communication with the ocean, the southern portion of the lagoon is considered an estuarine environment, covering 1,000 square kilometers, and can be varied by the wind.

Regarding the shrimp farming, the pond has a great importance since it is the main source of supply to nurseries (OLIVEIRA *et al.*, 2014).

From a previous identification of the regional production process, through observation, interviews, and a literature search, specific questionnaires were developed for each actor associated with the local shrimp culture. Thus, the intention was to follow the performance and functionality of the production chain, from the raw materials needed for production to the moment of acquisition of shrimp by the final consumer. The data were collected during the months from September 2008 to April 2010.

Sampling was undertaken by non-probabilistic accessibility, the elements that were accessible for data collection seeking efficiency, representativeness, and reliability of the characteristics of the collected data (GIL, 1995).

Interviews were conducted with individuals. This strategy proved to be the fastest and most efficient way to understand the main aspects of the

chain, seeking to gain information from the actors related to the expected or desired activity (GIL, 1995). One post larvae laboratory, five representatives of feed manufacturers, four representatives of aerator factories, four shrimp farm producers, one technical support and extension company, one research and teaching institutions, seven control and inspection agents, one institution of fomentation and incentive to credit, two middlemen, one fish market, two supermarkets, four restaurants and 49 final consumers were interviewed. In this manner, interviews included all links of the sea shrimp productive chain in the area at the time of the study.

With the purpose of measuring the intensity of opinions as objectively as possible, a scale of attractiveness was used, with a graded series of items. The use of the scale sought the perceptions of the respondents about the proposed study, and also indicated the degree of contentment with the current situation of the local activity. The scale consisted of five degrees, with the center corresponding to a neutral position.

We also observed the need for a macro analysis of the internal and external environment of the analyzed cities; thus, a SWOT matrix was constructed (*strengths*, *weaknesses*, *opportunities*, and *threats*). According to AZEVEDO and COSTA (2001), the SWOT matrix started to be developed in the 1960s, in American business schools. The objective was to define strategies for businesses to conserve their strengths, amortize the magnitude of their weaknesses, seize opportunities, and protect themselves from threats. According to CHIAVENATO (2003), to create the SWOT matrix, it would be necessary to perform the analysis in two ways, with environmental mapping and internal analysis. Environmental mapping is basically an analysis that occurs outside the organization to verify the opportunities that should be explored and the threats that must be contained. The internal analysis is an internal organizational diagnosis to check the forces that should be expanded and the weaknesses that should be improved or corrected. Finally, from the main goals set for the interviews and with the SWOT matrix, a strategy map was elaborated according to four perspectives of the BSC (balanced scorecard), applied to provide a dynamic description of how a supply chain can add value over time. Moreover, strategic maps represent cause and effect relationships between the strategic components, aiming to assist in understanding the main strategy followed by the stakeholders in the production chain (KAPLAN and NORTON, 2004).

RESULTS AND DISCUSSION

With the application and analysis of the questionnaires and interviews with the actors involved in the activity, it was possible to highlight the strengths and weaknesses in the processes of distribution and commercialization, which are interconnected in the shrimp culture in the study region, thereby providing a basis for discussion in the general scope.

At the tip of the production process, the raw materials group is the laboratory production of post larvae. The institution showed motivation to invest in research and development activities by understanding that they are of paramount importance in increasing the productivity of shrimp as well as for the socio-economic development of the region.

The same level of motivation to invest and work in the activity was also observed in the state of Santa Catarina, where all the respondents reported that they are motivated to work with shrimp culture, even with the problems at the time of the study with crossing due to white spot virus (White Spot Syndrome Virus – WSSV). This virus caused a fall in production and stopped the facilities in the state (FREITAS *et al.*, 2009b).

The supply of post larvae is considered normal to the market in Rio Grande do Sul, given that the laboratories have good conditions for transport and delivery, which occur in partnership with the production farms. The same is also observed in the state of SC, where there are no problems in terms of commercialization of the post larvae produced and the producing regions are not located far from the laboratories, making the logistics of distributing the product easier. However, this comes with the proviso that access to the farms has been assessed regularly as poor, by the respondents in the state, and on some roads on rainy days transport is virtually impossible (FREITAS *et al.*, 2009a).

With respect to the inputs used, they were considered to be of good quality; however, linked to that, greater expense occurs than expected and often laboratories suffer from a delay in delivery, since most of the inputs are imported. In the case of Rio Grande do Sul, the inputs are purchased through specialist companies in north-eastern Brazil and transferred to the institution.

According to PEREIRA *et al.* (2000), the majority of aquaculture inputs are available, especially in large cities of the north-eastern states. Although 14 years after the reporting of PIEDADE *et al.* (2002),

there are few laboratories to satisfactorily meet demand. Since their study points out as a major obstacle to the development of the productive chain the lack of laboratories and supplies able to satisfy the demands of the producing farms. Regarding the manpower of the laboratory, 90% consists of students and researchers from the Federal University of Rio Grande do Sul (FURG), which is good for the development and encouragement of research related to the production. There are also many cases of partnership between other universities, which emphasizes the importance of this link.

This fact is not exclusive to Rio Grande do Sul, where research, extension, and education go hand in hand for the development of activity in the north-east of the country, for example, in the Federal University of Ceará (UFC) and the Federal University of Santa Catarina (UFSC), where there are also incentives and support for diverse research on shrimp farming, which have collaborated for better development of the activity. With these actions, research on cultivation in Brazil, with universities and research institutes working in an integrated way, tends to advance.

As for growers, they find themselves motivated to participate in the development of the activity in the state. It is a general reflection of the producers in every region that the relative participation of the Brazilian shrimp had a higher yield compared with the originating shrimp fishery, obtaining an increase in the share of exports of around 48.38% between 1999 and 2003, among other positive aspects (Carvalho *et al.*, 2006).

The same is observed in many places in the world, but with considerable setbacks due, for example, to losses in production due to improper handling and/or the occurrence of diseases. Thus, with the economic infeasibility of the business, consequently the producer will encounter debt and become unmotivated. Unfortunately, many times, the activity is not considered risky, so the producer cannot be subject to the market changes, climate, and diseases that are present, and imposes a new attitude of managers, both towards profit and towards damage, who aim to remain on the market (Razzolini Filho, 2001; Guimarães and Brisola, 2002; Christopher and Towill, 2002).

In addition to the significant growth of activity in the region, the availability of technology appropriate to the climate of the southern region is also a great incentive for the producer. Drawing a parallel with the producers of shrimp in Santa Catarina, this was also evident, reinforcing that the technological

package of cultivation of the main species of marine shrimp produced in Brazil (*Litopenaeus vannamei*) is consistent and achieves high animal performance (Freitas *et al.*, 2009b).

The professionalization of consumer markets and increased competitiveness oblige producers to develop many processes, such as presentation and control products. It is also important to remember that the strengthening of the Brazilian products as successful brands will always be linked to the interplay between all the links of the production chain. It is not advisable in a globalized world of extreme competition for a producer to remain indifferent to the risks of production, failing to prepare for what could happen, as in the case of a low sales price for the product (Béné *et al.*, 2000). Knowing the company, the opportunities, and the threats in the market measures is necessary to establish future goals (Brisola and Oliveira, 2000).

The cultured shrimp in the study area is found in many commercial establishments, including public markets, fairs, supermarkets, and restaurants. Some of these establishments, especially the public markets in the region, find it difficult to work only with farmed shrimp, since the supply is not continuous. Many feel motivated to commercialize the shrimp due to their quality, but would like to have better access to the product.

When the product that arrives in shops is considered of excellent quality, some even indicated the presence of the SIF (Federal Inspection Stamp). The opinion on the importance of a seal or mark for the product is quite divided: some hold these values dear, while others do not find that these factors are important for the commercialization of shrimp, which goes against the opinions of consumers who stated in the questionnaires that they pay attention to the origin of the shrimp and consume more in the case of stamps and trademarks.

Corroborating this information, for example, only classified shrimp, filleted, packed, and frozen, would serve only about 40% of the American market (Ormond *et al.*, 2004). Brands, labels, and packaging, for example, identify the product, simplify the choices, and reduce the risks related to the purchase by consumers (Piedade *et al.*, 2002).

All the establishments interviewed somehow add value to the product before marketing, from the shelling and withdrawal of shrimp heads and vacuum packaging for marketing the frozen product to preparing the product for direct consumption, such as writing recipes and presenting dishes. However, unfortunately, the price is still considered the greatest hindrance to the diffusion

of eating habits, as is also noted by ORMOND *et al.* (2004), in their study. Thus, the key issue is that the product is brought to the consumer's table with the best possible quality and speed and at a low and competitive price (PEREIRA and CSILLAG, 2003).

In accordance with the above, most traders emphasize and discuss a more active form of marketing, coming from the city hall: action that will create a link between shrimp culture and tourism in the region. Developing tourist activities in shrimp farms can add benefits to the nearby communities and the local economy, thus increasing the income of the population and benefiting all the sectors of shrimp production. Well-planned tourism in this area can, in addition to promoting local development, also generate resources for the conservation of the areas used to grow (FREITAS, 2006).

Commercial use of aquaculture for tourism cannot be considered something new; for decades, especially in Europe and North America, several branches of activities have stimulated the curiosity of visitors and tourists from around the world (FREITAS, 2006). For example, in Brazil, in 2003 and 2004, respectively, the events of the WAS (*World Aquaculture Society*) in the city of Salvador, Bahia, and the first MERCOSUL Symposium on Aquaculture (Aquimerco) in Vitória city, Espirito Santo state took place, with an audience of over 4,000 people. These certainly leveraged tourism in the host cities in addition to the development of aquaculture (ANDRADE, 2007). Thus, tourism opens a wide range of possibilities for marketing shrimp culture in Rio Grande do Sul, from conferences and other activities in the area for the development of studies and research to tourist visitation of farms and gastronomic events related to shrimp.

As the final link in the production chain of shrimp, consumers attach high importance to the whole process since the ultimate goal of shrimp farming is the delivery of the shrimp to the consumer. The direct way to purchase fresh produce is at fairs or markets, or it can be purchased indirectly by consumption in restaurants and similar establishments. Thus, following the application of the questionnaire, it was possible to understand better what consumers expect when purchasing aquaculture products. In Table 1 below, we can identify the consumer profile of farmed shrimp in the study area.

Knowing who the consumers of current shrimp are is extremely important in determining their consumption habits and weighting the frequency of consumption in any branch of aquaculture, identifying the factors that affect the decision to purchase (COSTA *et al.*, 2009).

Several pieces of information are important to identify the consumers in the region, as well as to understand the various cultural, economic, social, and even psychological aspects that influence the buying of shrimp. Understanding these aspects involves identifying the weaknesses and potential threats in the activity of cultivation of marine shrimp in the region.

Not knowing the difference between fish and farmed shrimp is the biggest problem identified in the survey of consumers in the region (Table 2). According to the respondents, the main sites selling shrimp do not identify its origin, confusing the consumer, who does not know whether the product comes from local fishing or cultivation in shrimp farms.

When the consumer identifies the origin of the shrimp, he reaches the conclusion that the farmed

Table 1. Relationship between age, gender, income, and consumption of farmed shrimp among the consumers surveyed

	Gender			Age (years)				Monthly Family (Minimum wage income)		
	Total	Male	Female	Under 20	21 to 40	41 to 60	Above 60	Under 5	6 to 10	Above 11
Consume	64%	58%	42%	2%	76%	20%	2%	69%	18%	13%
Do not consume	36%	25%	75%	8%	59%	25%	8%	51%	33%	16%

Table 2. Relationship between age and sex and the reason for not consuming farmed shrimp

	Gender		Age (years)			
	Male	Female	Under 20	21 to 40	41 to 60	Above 60
Problems with a shrimp allergy	0%	5%	0%	7%	0%	0%
Do not know the difference between farmed shrimp and fish	67%	57%	100%	79%	33%	79%
Lack of supply in the market	33%	27%	0%	14%	67%	0%
High price	0%	11%	0%	0%	0%	21%

shrimp is superior in quality (size and aspect). Then, in his next purchases, he chooses to seek places where the shrimp sold is cultivated, unlike the case in Santa Catarina, where 60% of consumers have a preference for native species of shrimp from fishing (FREITAS, 2006).

In the case of respondents who showed dissatisfaction due to the lack of supply of the product in the market, they were actually classified within the percentage of those who did not know the difference in the origins of the shrimp, since the local sales of shrimp include both the shrimp and the grown fish (Table 3).

Therefore, it is necessary to pay greater attention to the way in which the farmed shrimp is presented to the final consumer. This is not just a problem in the analyzed region, but throughout Brazil. Studies of product development, marketing, logistics, and distribution of aquaculture crops are practically non-existent, and when they are present, they use imported models (ANDRADE, 2007).

According to FREITAS *et al.* (2009b), the price of shrimp in SC was the main reason hindering the adoption of shrimp as a constant dietary habit. Unlike in the present study conducted in Rio Grande do Sul, consumers were more concerned with further clarification of information about the origin of the shrimp to purchase it more often and with greater satisfaction.

According to research from the national study of household expenditure (LAVORENTI and GIANNOTTI,

Table 3. Relationship between family income, place of shrimp purchase, and possible changes in attitude

Monthly family income (minimum wage)	Place of purchase					Increased consumption with price change		Increased consumption with more information	
	Grocery	Supermarket	Fishmonger	Fair	Others[1]	Yes	No	Yes	No
Under 5	5%	26%	43%	21%	5%	52%	48%	89%	11%
6 to 10	6%	23%	37%	17%	17%	87%	13%	92%	8%
Above 11	12%	38%	5%	0%	45%	25%	75%	85%	15%

[1]Greengrocers and municipal markets.

1990), the habit of consuming seafood and fish in southern Brazil is still small compared with the consumption of beef, which is still the main source of protein in the region. Beef is the most consumed meat by both men (81.0%) and women (60.4%), followed by poultry meat (VELHO *et al.*, 2009).

Therefore, through the perception of all the data collected during the research, it is possible to identify the positive and negative points that occur between all the links of the production chain of local marine shrimp culture. This identification is possible through a SWOT analysis (*strengths*, *weaknesses*, *opportunities*, *and threats*), which illustrates more objectively the obstacles faced and the strengths that can be used to minimize them.

This kind of analysis represents an effort to examine the interaction between the particular characteristics of the supply chain from the cultivation of marine shrimp in Rio Grande do Sul and the context into which it is inserted. It has several applications and can be applied to all the links that organize this chain, focusing only on the key factors for the success of the whole (Table 4).

From the foregoing information in the SWOT matrix, a strategy map was elaborated (Figure 1), with the purpose of considering the prospect of increasing the efficiency and competitiveness of the productive chain of marine shrimp culture in Southern Brazil. On this map, it is possible to check which strategic relationships within the four perspectives of the BSC should be adopted to achieve the strategic theme.

As an example of this relationship, we can mention that the increased motivation and empowerment of stakeholders are likely to cause an increase in knowledge about the characteristics and precedence of products and their productivity, meaning that collaborators will have greater ease in identifying the needs and presence of consumers. This efficiency in services, from the perspective of customers, causes customer satisfaction, thereby increasing the market share against competitors. Therefore, an increase in demand could reduce the prices, increase the profitability of hulling, and effect increases in the incomes of the population depending on this supply chain, ultimately creating value for the local marine activity shrimp culture.

To corroborate, seconded by DALPIAN *et al.* (2012), activities geared to learning, training, and technical improvement of the stakeholders can be decisive in the evolution of the other links in the chain in question. Regarding human development, there has been an improvement in processes, achievement, and customer satisfaction and, consequently, positive developments in the objectives from the financial perspective. These, in turn, feed back into the system, producing a continuous growth process integrated into all the perspectives of the organization.

Therefore, the map can provide a systemic and clear vision of the goals to be reached, but it is up to each link in the supply chain to identify the initiatives, as well as the indicators and targets, to be adopted for the implementation and assessment of compliance strategies.

Table 4. SWOT (strengths, weaknesses, opportunities, threats) of local activity

| OPPORTUNITIES	THREATS
- Partnership with teachers, researchers, and students of the Federal University of Rio Grande do Sul;	
- Regional tourist activity;	- Bad use and degradation of natural resources.
- Local interest by tourists and by the consumption of shrimp.	
WEAKNESSES	**STRENGTHS**
- Traditional consumption of beef;	- Wide diversity and abundance of natural resources.
- Lack of information about the origin of the shrimp.	
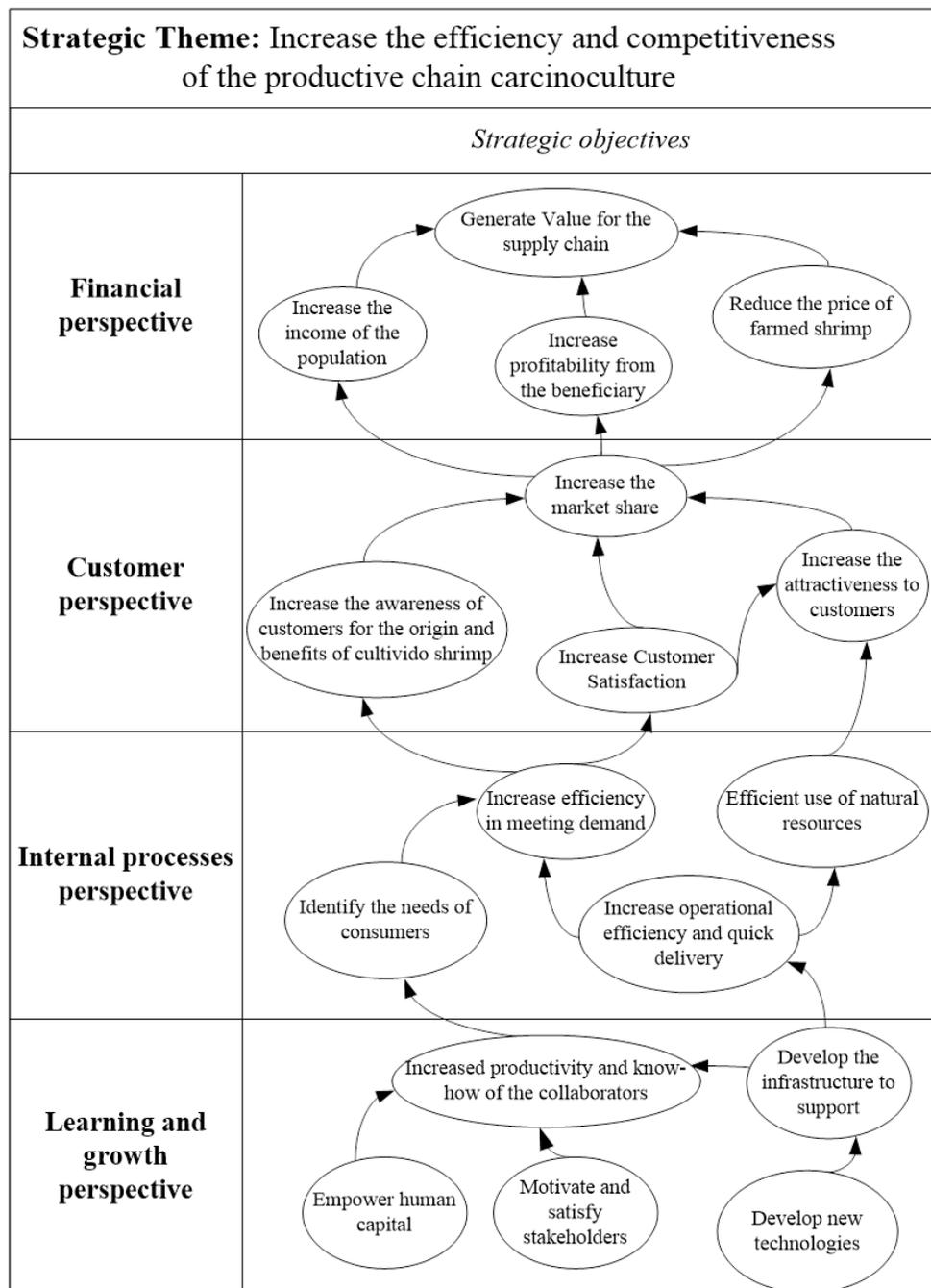
Figure 1. Strategic map of marine shrimp farming in the extreme south of Brazil.

CONCLUSIONS

The excellent production perspective, combined with the performance of the Marine Aquaculture Station of the Federal University of Rio Grande (EMA-FURG), regarding the activity, currently provides producers and investors of Rio Grande do Sul with a positive scenario in the estuary region of Lagoa dos Patos. However, from the results obtained in this study it is evident that sectors of the local supply chain expect a system able to consolidate already-established sectors and the expansion of unexplored niches.

For example, marketing actions can be developed to strengthen the relationship between the producer and the consumer, aiming to achieve better dissemination and acceptance of farmed shrimp, besides contributing to the improvement of its distribution among the business establishments in the region, thus ensuring continuous development of the activity.

Additionally, from a systemic view of the internal environment, including strengths and weaknesses and the external environment, the observation of the opportunities and threats and the strategic objectives that influence the progress of business activities is possible.

Finally, projects aiming to give more dynamism to the chain should be treated as a priority going forward, if there really is a desire for the local marine shrimp culture to cease to be an interest and for the future potential to become a happy reality.

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REFERENCES

ANDRADE, H.K. **Impactos da aquicultura sobre o turismo no Espírito Santo**. Vitória: SEBRAE-ES, 2007. 76p.

AZEVEDO, M.C.; COSTA, H.G. Métodos para avaliação da postura estratégica. **Caderno de Pesquisas em Administração**, v.8, p.1–18, 2001.

BÉNÉ, C.; CADREN, M.; LANTZ, F. Impact of cultured shrimp industry on wild shrimp fisheries: analysis of price determination mechanisms and market dynamics. **Agricultural Economics**, v.23, p.55–68, 2000.

BRISOLA, M.V.; OLIVEIRA, L.H. A busca da excelência através do planejamento estratégico em cooperativa agropecuária: um estudo de caso. In: SEMINÁRIO SULBRASILEIRO DE ADMINISTRAÇÃO RURAL, 1., 2000, Itajaí.**Anais...** Itajaí: ABAR, 2000. CD-ROM.

CARVALHO, E.B.S. Estratégia para estimulo ao fortalecimento de clusters de serviços. In: CONGRESSO DO CONSELHO LATINO AMERICANO DE ESCOLAS DE ADMINISTRAÇÃO, 38., 2003, Lima. **Anais...**Lima: [s.n.], 2003.

CARVALHO, J.M.M.; NASCIMENTO, F.O.T.; FEITOSA, R.A.; PAULA NETO, F.L. O agronegócio do camarão cultivado no nordeste Brasileiro, uma boa oportunidade de investimento. In: CONGRESSO DA SOCIEDADE BRASILEIRA DE ECONOMIA, ADMINISTRAÇÃO E SOCIOLOGIA RURAL, 42., 2004, Cuiabá. **Anais**...Cuiabá: SOBER, 2004. p.1-18.

CASTRO, A.M.G. **Análise da competitividade de cadeias produtivas**. In: WORKSHOP CADEIAS PRODUTIVAS E EXTENSÃO RURAL NA AMAZÔNIA, 2000, Manaus. **Anais...** Manaus: SUFRAMA/EMBRAPA, 2000. 18p.

CASTRO, A.M.G. Prospecção de cadeias produtivas e gestão da informação. **Transinformação**, v.13, p.55–72, 2001.

CASTRO, A.M.G.; LIMA, S.M.V.; CRISTO, C.M.P.N. Cadeia produtiva: marco conceitual para apoiar a prospecção tecnológica. In: SIMPÓSIO DE GESTÃO DA INOVAÇÃO TECNOLÓGICA, 22., 2002, Salvador. **Anais...** Salvador: USP/UFBA, 2002. p.1-14.

CHIAVENATO, I. **Introdução à teoria geral da administração.** 7.ed. Rio de Janeiro: Elsevier, 2003. 634p.

CHRISTOPHER, M.; TOWILL, D.R. Developing Market Specific Supply Chain Strategies. **International Journal of Logistics Management**, v.13, p.1-14, 2002.

COSTA, A.D.; ALMEIDA, I.C.; OLIVEIRA, J.S. **Mercado e perfil do consumidor de peixe no estado do Pará**. Ananindeua, PA: Universidade Federal Rural da Amazônia, 2009. 5p.

DALPIAN, V.; COLOMBELLI, G.L.; PORTO, A.; MICHELIN C.F. Estruturação do balanced scorecard como ferramenta de gestão estratégica na Cooperativa

Tríticola Cachoeirense Ltda. In: ENCONTRO NACIONAL DE ENGENHARIA DE PRODUÇÃO, 32., 2012, Bento Gonçalves. **Anais...**Bento Gonçalves: ABEPRO, 2012. p. 1-12.

FAO - FISHERIES AND AQUACULTURE DEPARTMENT, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. **The state of world fisheries and aquaculture.** Rome, Italy: FAO, 2012. 209p.

FAO - FISHERIES AND AQUACULTURE DEPARTMENT, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. **The State of world Fisheries and aquaculture**. Rome, Italy: FAO, 2014. 223p.

FIALA, P. Information sharing in supply chains. **Omega**, v.33, p.419–423, 2005.

FREITAS, R.R. Aquicultura aliada ao turismo como alternativas de lazer e fonte de renda. **Caderno Virtual de Turismo**, v.6, p.48-54, 2006.

FREITAS, R.R.; COSTA, K.G.; SILVESTRI, F. Maricultura e meio ambiente: tecnologias, impactos e sustentabilidade. **Revista Brasileira de Agroecologia**, v.4, p.107–113, 2009a.

FREITAS, R.R.; VINATEA, L.; NETTO, S.A. Analysis of the marine shrimp culture production chain in Southern Brazil. **Anais da Academia Brasileira de Ciências**, v.81, p.287–295, 2009b.

FREITAS FILHO, A.; CASTRO, A.M.G.; LIMA, S.M.V.; JOHNSON, B.B. Capacitação em prospecção tecnológica em P&D: Brasil e América Latina. In: SIMPÓSIO DE GESTÃO DA INOVAÇÃO TECNOLÓGICA, 21., 2000, São Paulo. **Anais...**São Paulo: USP, 2000. p.1-16.

GIL, A.C. **Métodos e técnicas de pesquisa social.** 4th ed. São Paulo: Atlas, 1995. 207p.

GUIMARÃES, M.C.; BRISOLA, M.V. O ECR como ferramenta contemporânea de Marketing: da era da produção à era do valor ao cliente. **Revista de Administração e Contabilidade**, v.3, p.22–26, 2002.

HARLAND, C. Supply networks strategies: the case of health supplies. **European Journal of Purchasing & Supply Management,** v.2, p.183–192, 1996.

HOFFMANN, W.A.M.; GREGOLIN, J.A.R.; OPRIME, P.C.A. Contribuição da inteligência competitiva para o desenvolvimento de arranjos produtivos locais:

caso Jaú-SP. **Encontros Bibli: Revista Eletrônica de Biblioteconomia e Ciência da Informação**, p.27–46, 2004. Especial.

KANNAN, V.R.; TAN, K.C. Just in time, total quality management, and supply chain management: understanding their linkages and impact on business performance. **Omega**, v.33, p.153–162, 2005.

KAPLAN, R.S.; NORTON, D.P. **Strategy maps:** converting intangible assets into tangible outcomes. Boston: Harvard Business School Press, 2004. 454p.

LARSON, P.D.; ROGERS, D.S. Supply chain management: definition, growth and approaches. **Journal of Marketing Theory and Practice**, v.6, p.1-5, 1998.

LAVORENTI, A.; GIANNOTTI, O. Resíduos de pesticidas em alimentos e segurança dos consumidores. **Revista de Agricultura**, v.65, p.15–35, 1990.

NEVES, M.F.; MACHADO FILHO, C.P.; CARVALHO, D.T.; CASTRO, L.T. Marketing da carne bovina com visão de redes de empresas ("Networks"). **Organizações Rurais & Agroindustriais,** v.4, p.73–85, 2002.

NEVES, M.F.; MARTINELLI, D.P.; MELLO, M.C. Batata: um incrível caso de agregação de valor. In: CONGRESSO DA SOCIEDADE BRASILEIRA DE ECONOMIA E SOCIOLOGIA RURAL, 37., 1999, Foz do Iguaçu. **Anais**... Foz do Iguaçu: 1999. p.224.

OLIVEIRA, D.; FERREIRA, W.; ASMUS, M. **Caracterização dos ecossistemas e identificação dos níveis de ocupação antrópica da margem do canal de navegação da cidade de Rio Grande, RS**. Available at: < http://observatoriogeograficoamericalatina.org.mx/egal12/Procesosambientales/Ecologia/21.pdf>. Access: Apr. 25, 2014.

ORMOND, J.G.P.; MELLO, G.A.T.; FERREIRA, P.R.P.; LIMA, C.A.O. A Carcinicultura Brasileira. **BNDES Setorial**, v.19, p.91–118, 2004.

PEREIRA, S.C.F.; CSILLAG, J.M. Estudo dos tipos de relacionamentos na cadeia de frango de corte no Brasil: uma abordagem sob a perspectiva do Supply Chain Management. In: SIMPÓSIO DE ADMINISTRAÇÃO DA PRODUÇÃO E OPERAÇÕES, 6., 2003. São Paulo. **Anais...** São Paulo: FGV, 2003. p.1-15.

PEREIRA, J.A.; SILVA, A.L.N.; CORREIA, E.S. Situação atual da aquicultura na região nordeste. In: VALENTI, W.C.; POLI, C.R.; PEREIRA, J.A.; BORGUETTI, J.R. (ed.).

Aquicultura no Brasil: bases para um desenvolvimento sustentável. Brasília, DF: CNPq, 2000. p.267-288.

PIEDADE, K.R.; NEVES, M.F.; SANTOS, M.J.M. Caracterização da rede produtiva do camarão de água doce no Brasil. In: CONGRESSO BRASILEIRO DE ECONOMIA E SOCIOLOGIA RURAL, EQUIDADE E EFICIÊNCIA NA AGRICULTURA BRASILEIRA, 40., 2002, Passo Fundo.**Anais...**Passo Fundo: Universidade de Passo Fundo, 2002. CD-ROM.

RAZZOLINI FILHO, E. Supply chain management – SCM: uma tentativa de conceituação. **Tuiutí**, v.24, p.79–98, 2001.

RIBEIRO, C.R. **Processos de alteração da maré astronômica na desembocadura da Lagoa dos Patos.** 2008. 99f. Dissertation (Master of Ocean Engineering) – Universidade Federal do Rio Grande, Rio Grande, 2008.

ROBINSON, C.J.; MALHOTRA, M.J. Defining the concept of supply chain quality management and its relevance to academic and industrial practice. **International Journal of Production Economics**, v.96, p.315–337, 2005.

SOUSA JÚNIOR, J.P.; KHAN, A.S.; LIMA, P.V.P.S.; MADRID, R.M.M. Marine shrimp production in captivity: An analysis of technical, allocative and cost efficiency. In: ASIA-PACIFIC PRODUCTIVITY CONFERENCE, 1., 2004, Brisbane. **Proceedings**…Brisbane: Centre for Efficiency and Productivity Analysis (CEPA)/University of Queensland, 2004. p.1–30.

VELHO, J.P.; BARCELLOS, J.O.J.; LENGLER, L.; ELIAS, S.A., OLIVEIRA, T.E. Disposição dos consumidores porto-alegrenses à compra de carne bovina com certificação. **Revista Brasileira de Zootecnia**, v.38, p.399–404, 2009.