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**Competitiveness Factors in light of Porter's Diamond:  
A Multi-Case Study in the Salt Industry of the State of Rio Grande do Norte**

**Fatores de Competitividade à Luz do Diamante de Porter: Estudo Multicaso no Segmento  
Salineiro do Estado do Rio Grande do Norte**

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**ABSTRACT**

This study aims to identify competitiveness factors, in light of Porter's Diamond, in the salt industry of Rio Grande do Norte. A qualitative, descriptive, exploratory and multi-case study was conducted with three salt mines, developed through triangulation of semi-structured interviews with the manager of each company, direct observation and content analysis. Subsequently, the data transcripts were imported into the ATLAS.ti 8.4 software, where the networks were developed. The results show that natural resources are favorable to the salt industry activity, and that the conditions influence the production factors, stimulating the innovation of technological resources. The salt produced satisfies the external market. As for related industries, it was found that the lack of support from government spheres is unfavorable to logistics. The dimension of strategy, structure and rivalry is identified in the excellence of the salt quality, constituting the mechanism for competitive advantage. The contribution of this study is the understanding of the competitiveness factors for the progress of salt industry organizations in the market.

**Keywords:** Porter's Diamond. Industrial management. Competitive advantage. Saline Industry. Production factors.

**RESUMO**

Este estudo tem como objetivo identificar fatores de competitividade, à luz do Diamante de Porter, no segmento salineiro do Rio Grande do Norte. Realizou-se pesquisa qualitativa, descritiva, exploratória e multicaso com três salinas, desenvolvido mediante triangulação de entrevistas semiestruturadas com o gestor de cada empresa, observação direta e análise de conteúdo. As transcrições foram importadas para o software ATLAS.ti 8.4, onde as redes foram elaboradas. Os resultados evidenciam que os recursos naturais são propícios à atividade salineira, e que as condições influenciam os fatores de produção, estimulando a inovação dos recursos tecnológicos. O sal produzido satisfaz o mercado externo. Quanto às indústrias correlatas, constatou-se que a falta de apoio das esferas governamentais desfavorece a logística. A dimensão da estratégia, estrutura e rivalidade, é identificada na excelência da qualidade do sal, constituindo o mecanismo para a vantagem competitiva. A contribuição deste estudo é a compreensão dos fatores de competitividade para o progresso das organizações salineiras no mercado.

**Palavras-chave:** Diamante de Porter. Gestão industrial. Vantagem competitiva. Indústria Salineira. Fatores de produção.

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## 1 INTRODUCTION

According to data from the U.S. Geological Survey (USGS), global salt production was estimated at 280 million metric tons (Mt) in 2024. Within this scenario, China leads the salt industry with a production of 55 Mt, followed by the United States with 40 Mt. Brazil produced 6.6 Mt, representing approximately 2.36% of the global total (U.S. Geological Survey, 2025).

According to the *Brazilian Mineral Summary* (SMB) of 2018, the most recent edition published by the *National Mining Agency* (ANM) (BRASIL, 2018), Brazil's productivity was estimated at around 2.67% of the world's total, with exports reaching 0.964 Mt, equivalent to US\$ 21.5 million (BRASIL, 2018). The State of Rio Grande do Norte accounted for 77.3% of the country's total salt production and 94.5% of marine salt production, in addition to contributing to the increase in export rates due to the region's favorable climate (BRASIL, 2018). In the first quarter of 2019, compared to the same period in 2018, Rio Grande do Norte expanded its salt export rate from 383 thousand to 561.8 thousand, equivalent to US\$ 12 million (SEBRAE, 2019).

Although the ANM has not updated the SMB since 2018, data released by the Government of the State of Rio Grande do Norte (2023) report a representative production of 6.5 million tons, equivalent to 95% of the total marine salt produced nationally. Another relevant factor is that the state was responsible for employing 56 thousand people in the salt industry, with expectations of increased demand. Therefore, the salt sector in Rio Grande do Norte is decisive for both regional and national economies, especially because the semi-arid coastline presents favorable conditions for marine salt production, such as high natural water salinity, low-permeability soils, and minimal silting of estuaries (Silva et al., 2017).

Diniz and Vasconcelos (2017) identify the fluvio-marine plains of the Mossoró and Açu rivers, located in the *Costa Branca* region, as responsible for producing 49% and 37.5%, respectively, of the nation's marine salt. The geomorphological conditions favorable to these areas, along with the proximity to *Porto-Ilha*, located in the city of Areia Branca, which facilitates the distribution of production to other Brazilian states, are factors that enhance the region's salt economy and make it essential to the country (Diniz & Vasconcelos, 2017).

From Porter's (1990) perspective on production factors, the salt sector benefits from basic or inherited productive elements such as climate and terrain. However, Porter (1996) emphasizes that it is fundamental for organizations to enhance productivity factors as a means of competing strategically. In this regard, the intense competition derived from globalization

has enabled companies worldwide to recognize the importance of gaining an advantage over competitors to ensure the survival of their businesses.

Thus, organizations must focus on developing strategies through the study and analysis of competitive factors inherent to their localities as a means to obtain and sustain competitive advantage (Kharub & Sharma, 2017). In this perspective, the study conducted by Porter (1990) introduced the “Porter Diamond” theory, composed of four aspects: factor conditions, demand conditions, related and supporting industries, and firm strategy, structure, and rivalry. The dynamics of these determinants contribute to the flow of national competitiveness, shaping an environment that enables organizations to achieve competitive success.

Accordingly, several national and international studies have been identified, in addition to Porter (1990), addressing this theme, such as Sabino, Tavares, and Marinho (2015); Lacerda et al. (2016); Sales (2016); Weber et al. (2016); Diniz and Vasconcelos (2017); Tavares et al. (2017); Gonçalves et al. (2018); Hall et al. (2018); Kharub and Sharma (2018); Santos et al. (2018); and Silva, Nascimento, and Melo (2021). However, there remains a shortage of studies analyzing the competitiveness factors of specific industries.

Given this context, the following research question emerges: **what are the competitiveness factors, in light of Porter’s Diamond, in the salt industry of the State of Rio Grande do Norte?** Accordingly, the general objective of this research is to identify the competitiveness factors, based on Porter’s Diamond, in the salt industry of Rio Grande do Norte.

The justification for this study lies in the relevance of exploring competitiveness factors in the salt industry, given the importance of this market segment for the socioeconomic development of the Rio Grande do Norte region. Thus, the intended contribution of this research is to assist the decision-making process of salt industry organizations by providing managers with a basis for understanding the competitive factors inherent to the sector and its significance for the local and national economy.

## 2 THEORETICAL FRAMEWORK

### 2.1 COMPETITIVE ADVANTAGE

The constant changes occurring in the macroenvironment of nations, which affect organizations and industries, generate the need for managers to understand the forces that drive the pursuit of competitive advantages. In line with this perspective, a nation’s competitiveness depends on the innovative capacity of its industrial sectors. Thus, firms achieve competitive

advantages through innovative actions stimulated by the perception of market opportunities combined with the pressures and challenges inherent to the environment, which enable their strengthening (Porter, 1990).

From this perspective, it is essential that organizations invest in the pursuit of opportunities, learning, and the development of organizational knowledge, as well as maintain a culture of trust among members in order to achieve better results related to knowledge management, since it affects organizational performance and effectiveness, contributing to the attainment of competitive advantage over competitors (Centenaro et al., 2016).

In this regard, sociocultural and economic differences act in a way that enables the competitive success of nations in certain sectors, depending on the challenges and dynamics of the internal environment. Accordingly, Porter (1990) argues that competitive success is founded and sustained by a highly localized process, in which competitiveness in specific activities or sectors results from consumer needs or preferences.

Therefore, organizations must be aware of the type of competitive advantage that is most relevant to achieve. In this regard, Porter (1985, 1999) argues for the coexistence of two generic strategies for gaining advantage: cost leadership, which corresponds to the firm's advantage resulting from its preference for low industrial costs, and differentiation leadership, when the company aims to be a reference in its segment and therefore focuses on meeting the needs of a specific target audience.

Cost advantage requires advanced production technologies, as well as low-cost labor and raw materials, while differentiation sustains advantage by adding value to the brand and being derived from heterogeneous technology that makes imitation by competitors difficult (Grant, 1991). In this context, Porter (1996) and Barney (1991) consider that firms strategically sustain their competitive advantages through the exploitation of their efficient internal strengths, creating distinctive elements and unique characteristics that maintain their superior performance in relation to competitors.

Based on these strategies, Hall et al. (2018) conducted a study analyzing the competitiveness of sixty-seven agribusiness firms listed on B3, aiming to determine which firms were more competitive according to their value creation, that is, those that sold more by opting for cost leadership and those that preferred to invest in differentiation as a means of sales leadership. The results showed that the firms considered leaders were those that generated value through cost efficiency, in the following order: Fábrica Renaux S.A., Renar Maças S.A., Brasilagro-CIA, and Nutriplant S.A. Conversely, those that achieved competitive advantage

through heterogeneity were AMBEV S.A., BRF Brasil Foods S.A., Consan Limited, and Cosan S.A. Ind. & Com.

From this perspective, the government should foster the growth of institutional competitive performance through public policies that encourage national competition and innovation, as a means of enabling firms to gain advantages within their industries, based on the assumption that rivalry among domestic competitors in the pursuit of competitive advantage provides a solid foundation for achieving competitiveness at the global level (Porter, 1985, 1990).

In line with this, the study *The Competitive Advantage of Nations* conducted by Porter (1990) outlines four attributes that constitute the “diamond” of national advantage, commonly known as Porter’s Diamond: factor conditions, demand conditions, firm strategy, structure and rivalry, and related and supporting industries. According to the author, the dynamics of these aspects contribute to the flow of national competitiveness, shaping an environment in which organizations evolve through learning to compete.

## 2.2 COMPETITIVENESS FACTORS

The accessible sources of resources, the information that enables opportunities, the qualified coordination that directs resource utilization and manages skills, the stakeholders’ objectives, and the macro-environmental pressures for innovation and investment are relevant aspects that influence the points of the national advantage Diamond. This system is structured in such a way that the fragility of one attribute interferes with the effectiveness of the others, negatively affecting the progress capacity of an industrial sector and its competitive success (Porter, 1990).

According to Porter (2001), the conditions of production factors correspond to the set of qualified human resources, improved technologies and infrastructures for specific productions, and the composition of capital (either owned or financed by third parties) that sustains the essential investments for companies. These attributes inherent to production enable high levels of productivity.

Production factor conditions can be classified as basic and advanced. Basic factors are associated with tangible or even inherited resources (such as climate, soil, or location). However, to develop an advanced economy, it is necessary to create and enhance productive factors, with skilled human resources and a solid scientific foundation. Thus, institutions whose production factors are specialized and constantly updated, derived from sustained high

investments, make competition more difficult and therefore achieve competitive advantage. Hence, industries require skilled labor to innovate, as well as domestic rivals that act as stimuli to innovation (Porter, 1990).

Diniz and Vasconcelos (2017) conducted a study to examine the natural dynamics of the determinants influencing the economy of the salt industry. The research found that, beyond climatic aspects, other factor conditions, such as low soil permeability, accumulation of silt and clay, the size of areas submerged by tides, the slope of the plains, and the natural salinity of confined waters, are determining factors for marine salt production.

Given this, Tavares et al. (2017) carried out a bibliometric study on the types of resources considered sources of competitive advantage for the agribusiness sector. According to the study, the physical resources indispensable for maximizing productivity in the sector were defined by location, favorable natural aspects such as vegetation, climate, and land, in addition to easy access to other raw materials. However, it was also concluded that technological resources in the sector are crucial for the advanced development of inputs and quality improvement in production, and that specialized technologies enable higher levels of efficiency in soil management, aiming at cost reduction and environmental sustainability.

The analysis by Tavares et al. (2017) also found that, for the agribusiness sector, human resources, such as experience, knowledge management, skills, and competencies, are essential. In alignment with this, the research conducted by Sales (2016) identified that the interconnection among industries in the salt sector has led to a skilled labor force in the field, resulting from the experience acquired by workers who have circulated among the saltworks over time.

Hall et al. (2018) corroborate the view that intangible resources, by adding unique value to each company, affect business competitiveness, as they are fundamental to differentiating the firm and hindering imitation by competitors. Additionally, these resources are recognized in the analyses of Tavares et al. (2017) as drivers of reputation in the agribusiness sector, characterized by regional values such as tourism-related landscapes and local sociocultural identity.

For Porter (2009), demand conditions also impose challenges that create competitive advantages for firms. In this regard, Pinto et al. (2018) establish that the composition of demand constitutes a direct cause-and-effect relationship with production factors, since buyer needs require resource improvement. Sales (2016) adds that consumers seek meaningful quality, fair prices, and prompt service.

From this perspective, the competitive success of nations in certain sectors results from transparency and anticipation of primary customer needs, as well as the ability to meet the high standards of demanding clients who drive innovation and agility. Thus, a sophisticated domestic demand allows the achievement of competitive success at the global level (Porter, 1990, 2009).

Porter (2001) argues that strategy is grounded in maintaining management focused on the conditions and demands imposed by clients. In this sense, it is essential to build a strong strategic foundation capable of keeping pace with the volatility of customer demand in a constantly changing environment. Grant (1991) emphasizes that, through high levels of capability, creativity, and differentiation, the organization gains a more stable strategic foundation.

Consistent with this context, the study by Gonçalves et al. (2018) sought to identify growth strategies used by a company in the beverage industry. The findings revealed that the organization focusing on operational excellence as its differentiating factor, prioritizing quality in customer service, an approach that strengthened customer satisfaction and contributed positively to profitability.

Still within this framework, Sales (2016) highlights that the salt industry innovates in response to customer demands and requirements, which include the need for new technologies, transportation methods, and equipment that improve and maintain salt quality while reducing costs. Consumers generally seek lower prices, as well as safety throughout the production process and improved local infrastructure, especially concerning hygiene, as a way to prevent product contamination and increase value-added, thereby making the organization more competitive.

Related and supporting industries constitute the third determinant of the Diamond of National Advantage. An industry builds operational advantage when its suppliers, with international competitive potential, are located nearby. This proximity facilitates access to inputs, speeds up raw material acquisition, and reduces transaction costs, thus increasing production efficiency (Porter, 2009). However, Sales (2016) found that suppliers to the salt industry are mainly located in the South and Southeast regions of Brazil and, due to the specific characteristics of the sector, travel to the Northeast to supply their products.

In line with this approach, Lacerda et al. (2016) studied the competitive factors present in the clothing cluster of João Pessoa, in the state of Paraíba, and observed that most suppliers are located within the municipality, which maximizes the agility of information flow.

Furthermore, the environment was found to be advantageous for support relationships, enabling cost reduction and the sharing of machinery and equipment. Nevertheless, it was also identified that local competitive forces are not being fully leveraged. In this context, Cardoso et al. (2023) reinforce the relevance of the related and supporting industries dimension in Porter's Diamond by demonstrating that the industrial complex positively impacts local economic growth.

The proximity between suppliers and buyers enables communication as a flow of innovative ideas that stimulate modernization. Thus, organizations influence the advancement of their suppliers' productive capacity (Porter, 1990). However, Sales (2016) found that, in the salt industry, there is no support from technological centers dedicated to salt research and product development, which is attributed to the lack of union organization within the sector.

Consequently, the fourth conditioning aspect of Porter's Diamond theory encompasses the set of *Strategy, Structure, and Rivalry* that guides organizations. According to Porter (1990), these factors are predetermined by the national context and influence corporate management practices and administrative structures, shaping the strategic competitiveness of each economic sector. Personal motivation and individual talent constitute the main determinants for achieving national success (Porter, 1990). In the salt industry, family generations have been educated with a strong commitment to the business (Sales, 2016).

Competitive strength is stimulated by internal rival concentration. Domestic rivalry fosters sustained competitive advantage, as local competition continually drives innovation, productivity improvements, and process efficiency (Giusti et al., 2021). Moreover, the success of one domestic competitor encourages the competitiveness of others and is, therefore, more significant than that of foreign rivals operating in different economic contexts (Porter, 2009).

In this regard, Sales (2016) shows that the salt industry exhibits high regional rivalry, prompting managers to continuously refine corporate strategic planning to assist decision-making related to production purchases, investments, maintenance, and general needs. Additionally, they focus on client acquisition, prioritize quality as a strategic foundation, and set prices aligned with those of competitors.

Furthermore, Silva, Nascimento, and Melo (2021) analyzed variables related to the development of the productive cluster in the salt industry, surveying a sample of 115 salt plant managers from Rio Grande do Norte. The variables were divided into four groups: Technological Innovation, Company–Community Relations, Institutional Action, and Competitiveness. Overall, the results revealed a low level of technology and cooperation; lack

of integration between company and community in corporate strategies; absence of an institutional agent in the structural process despite the evident need for institutional engagement; and the necessity for deconcentration and decentralization.

### 3 METHODOLOGY

This research is characterized as descriptive and exploratory, adopting a qualitative approach. It was developed through a multiple-case study, having as its research object three saltworks selected by convenience, due to the ease of access to managers, production capacity (volume in tons), and the structure of human resources (number of employees) during the harvesting periods.

The first saltwork, located in Macau/RN, has been operating for 125 years, producing around 900,000 tons of salt annually, with an average of 220 employees on staff. The second is located in the city of Areia Branca/RN, having operated in the market for 41 years and employing approximately 600 workers, reaching an annual production of 360,000 tons of the product. The third company is located in Mossoró/RN and, compared to the other saltworks analyzed, has the shortest time in the market, operating for 10 years. Despite this, it achieves the highest average production volume in Rio Grande do Norte, reaching approximately 2 Mt of salt per year, with a workforce of about 800 employees. All three companies carry out extraction, milling, and refining activities, producing around 3.25 Mt annually. Regarding company identification, the interviewed managers requested confidentiality; therefore, for analytical purposes, they will be referred to as Salt 1, Salt 2, and Salt 3.

The instruments used for documentary analysis included the 2018 *Mineral Summary*, issued by the *National Mining Agency* (ANM), which provides quantitative data on salt industry activities at the global level, along with a list of the main saltworks made available by the *Salt Industry Union of the State* (SIESAL), containing information on each company's share in the total salt volume produced in Rio Grande do Norte. On-site observation was satisfactory for the researchers' understanding, as it allowed them to become familiar with the production processes, machinery operation, and technological improvements implemented to meet customer requirements. The consolidation of the information collected occurred through the process of data triangulation (interview, observation, and documentary analysis).

The interview guide was divided into five sections, each corresponding to a factor that shapes Porter's Diamond: basic and advanced factor conditions; demand conditions; related and supporting industries; strategy, structure, and rivalry; and government. The interviews

were semi-structured, since, in addition to the pre-established questions, additional interactions occurred. Furthermore, the duration of each interview was limited to a single visit to each company, characterizing a cross-sectional time frame.

After this stage, the visits were scheduled with the administrative manager responsible for each company and took place according to the planned dates and times, with each interview lasting an average of two hours. Following their completion, the interviews were transcribed, and subsequently, the processing of the primary data was carried out through content analysis, defined by Bardin (2011, p. 44) as “a set of analysis techniques that employs systematic and objective procedures to describe the content of messages.” Accordingly, the data were imported into the software ATLAS.ti 8.4, organizing them in a way that facilitated the development of interpretations.

A code was assigned to each theme selected in the paragraph, which was then forwarded to the code manager. Subsequently, the classification into groups was carried out to compose the networks according to the analyzed dimensions: factor conditions, demand conditions, related and supporting industries, and strategy, structure, and rivalry. Then, the analyses and discussions of the constructed networks were conducted.

## **4 RESULTS ANALYSIS**

### **4.1 FACTOR CONDITIONS**

According to the study by Diniz and Vasconcelos (2017), basic factor conditions are fundamental for salt production. In line with this, the interviewed managers support the perspective that the northern region of Rio Grande do Norte is privileged for inheriting natural resources favorable to salt production. The climate, marked by low rainfall, high temperatures, and strong wind currents, assists in the evaporation process, which directly influences the quality of the product.

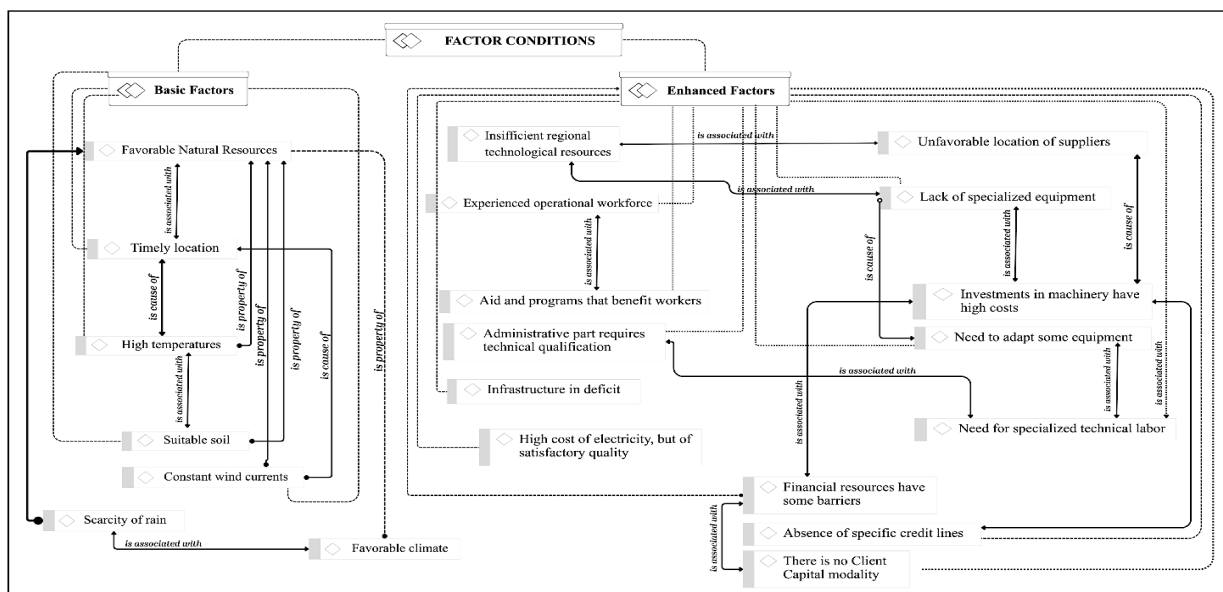
According to the interviewees, since the regional economy is characterized by salt-related activities, the regional concentration of saltworks has generated an experienced operational workforce in the sector, as local workers seek employment in these companies and acquire skills over the years. This finding corroborates the research of Sales (2016) and Tavares et al. (2017). In this context, managers report the existence of support and assistance programs for employees and their families, which contribute positively to performance and motivation in the workplace. Furthermore, to maximize efficiency in the operational sector, the administrative area is composed of individuals with technical knowledge and qualifications.

As stated by Tavares et al. (2017), specialized technological resources provide improvements in the quality levels of the salt produced. However, as illustrated in Figure 1 and consistent with the study of Sales (2016), the distance from suppliers of advanced technologies, most of whom are located in the southern and southeastern regions of the country, hinders investments due to the high transaction costs involved.

In addition, most of the equipment supplied to the saltworks is manufactured to serve various food industries, such as packaging machines designed for other types of grains, rather than specifically for salt production. This aligns with the findings of Silva, Nascimento, and Melo (2021), who observed that machinery from other industries is adapted for use in salt production. Thus, part of the equipment requires adjustment processes that demand labor, tools, and time. The relationships regarding the factor conditions identified in the interviews are represented in Figure 1.

**Figure 1**

### Factor Conditions



Source: Research data.

Another obstacle faced by the sector concerns financial resources. The managers highlighted the absence of specific credit lines for the segment and the high interest rates of existing bank loans, which constitute a barrier to investment. In addition, the interviewed companies do not receive customer capital in the form of advance payments, and therefore, temporary contracts are the instruments that ensure transactions. However, when necessary, they resort to discounted invoices to obtain working capital.

The difficulties encountered in the transportation of salt cargoes, resulting from the poor condition of highways that require expansion, combined with management issues at *Porto-Ilha* due to inadequate maintenance, are identified as consequences of inefficient government support and render the regional infrastructure unfavorable to the operational flows of organizations in the sector. However, although the electricity supplied meets quality standards, it represents a high cost for companies, making federal government action necessary to reduce the tariffs for the electricity services provided.

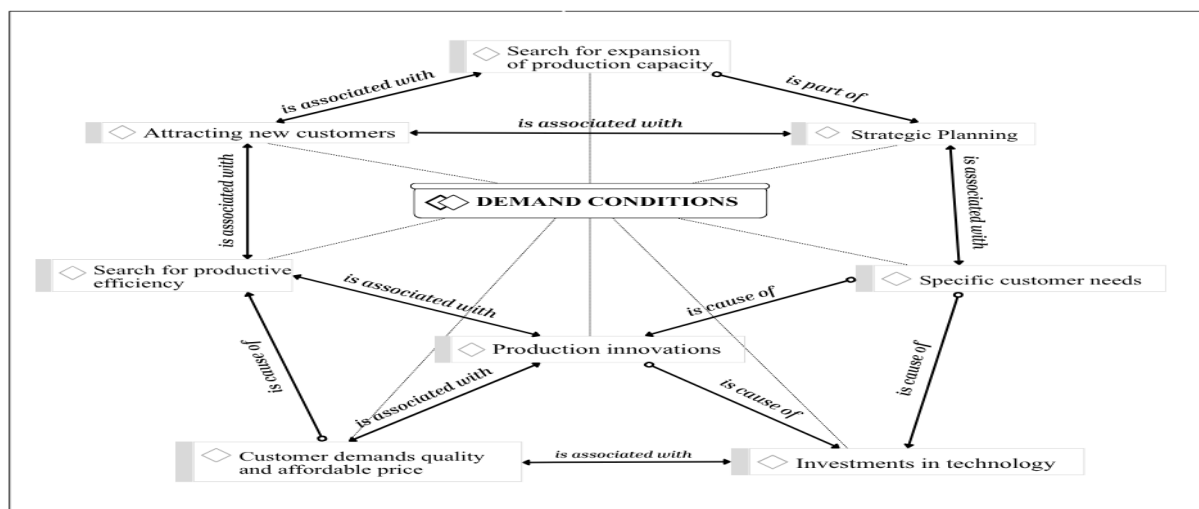
## 4.2 DEMAND CONDITIONS

The demands of the domestic market stimulate innovation in the salt industry, aiming to maximize the chemical quality of the salt, which consequently contributes to meeting external demand, corroborating Porter (1990). Managers explain that, although end consumers are not demanding due to a lack of knowledge about the importance of salt quality, food industries that are customers of the salt mines have high demands and specific requirements, as the salt condition directly influences the costs and manufacturing processes of their products.

In this sense, consistent with the research of Sales (2016) and Pinto et al. (2018), the salt industry innovates based on the specific needs of customers, improving production factors through investments in internal infrastructure, appropriate machinery and equipment, and adaptations to manufacturing procedures. The relationships between demand conditions in the salt industry are shown in Figure 2.

**Figure 2**

*Demand Conditions*



Source: Research data.

Furthermore, the interviewee from saline 1 highlights the existence of internal audits carried out by the clients themselves, which assess the conditions of production factors:

We undergo audits, several clients carry out audits here, so one required that the process, the machines in the refining unit be entirely made of stainless steel, so we deactivated a refinery and built new ones using entirely stainless steel material (...)

From this perspective, alongside the chemical quality requirements, there is a demand for safety regarding the hygiene of the production, storage, and transportation sites of the salt produced. Thus, it is necessary to use equipment for contaminant control and extraction, as well as to adopt cleaning measures and procedures that prevent product contamination.

Regarding price, the manager of Saltwork 2 explains that, due to the low cost of salt for the food industry and the constant inspection by environmental agencies, most buyers prioritize quality requirements over the pursuit of lower product prices.

(...) That client who is an industrial consumer, who is knowledgeable and truly more concerned with the details of quality and so on, is very demanding. And that's a good thing. I believe that the more demanding the client is, the more we grow and develop. The price of salt is very cheap, too low for the client to worry about it at first. At first, they are concerned with quality, and only afterward do they talk about price. They are even willing to pay a higher price if you provide them with greater assurance.

However, the intense regional competition is the main factor that determines the market price of salt. In this way, the company that focuses on meeting the specific demands of buyers achieves a competitive advantage through differentiation, as discussed by Porter (1999).

According to the manager of Saltwork 1, technological innovations and improvements in production control, in addition to generating customer satisfaction, contribute to business sustainability by enabling the expansion of production capacity, adding value to the company, and aiming to attract new buyers, as shown in Figure 2. Consequently, the strategic planning of the saltwork is focused on the development and growth of the company, based on meeting the demands imposed by the market.

#### 4.3 RELATED AND SUPPORTING INDUSTRIES

The absence of government support at the municipal, state, and federal levels negatively affects the salt industry. The interviewees stated that there are no public policies benefiting the sector and that, together with the existing disorganization and lack of union support, the

monetary value of salt becomes devalued in the market due to the price instability caused by the lack of control over internal competition.

Given this, the manager of Saltwork 2 stated that government mobilization to assist the sector occurs in a reactive manner, and it is essential to change this context by pursuing a proactive approach. This reality is consistent with the findings of Silva, Nascimento, and Melo (2021), who highlight that the lack of institutional involvement hinders the success of industry strategies, thus indicating the need for state intervention to promote development.

The manager of Saltwork 2 also emphasized that the informality, low educational levels, and lack of motivation among workers from coastal regions interfere with the productivity of these employees. However, he discussed the effectiveness of the school project founded by the company in partnership with the *Serviço Social da Indústria* (SESI), which aims to promote literacy to develop a qualified and motivated workforce. In addition, the *Serviço Nacional de Aprendizagem Industrial* (SENAI) provides training for employees in technical roles within the mechanical and electrical maintenance sectors.

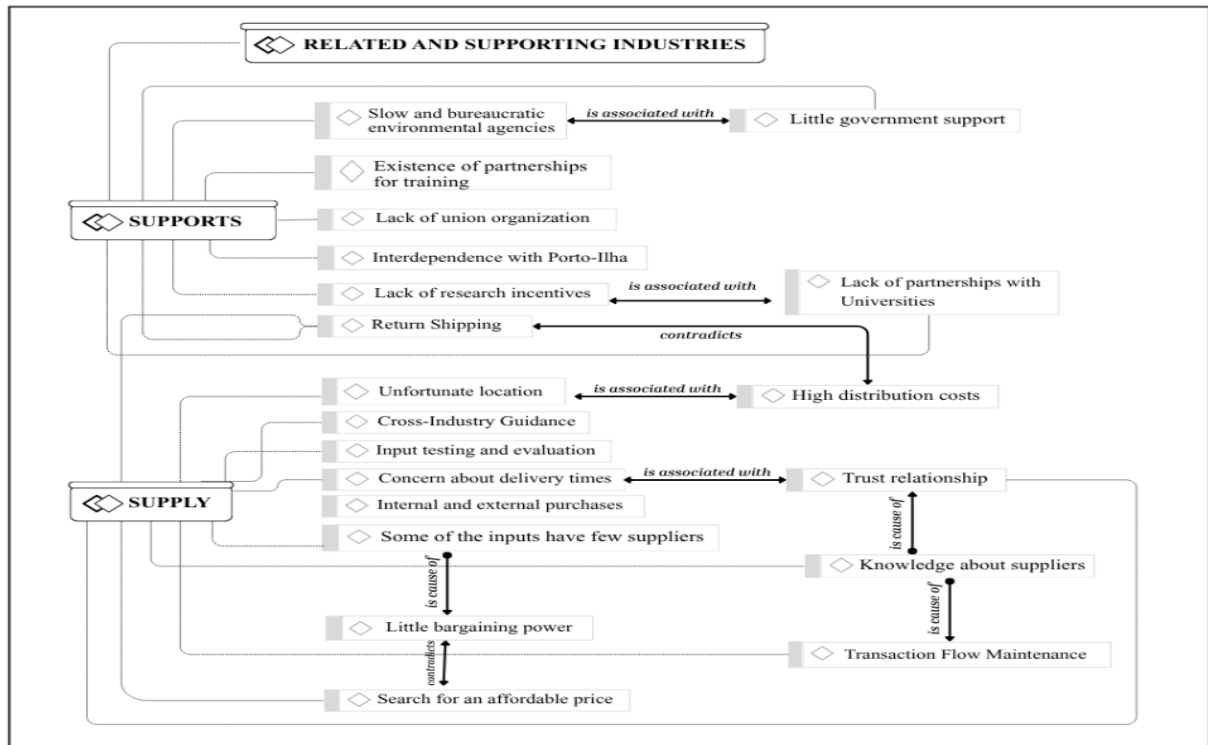
*Porto-Ilha* is essential for salt distribution and exportation, constituting a relationship of interdependence. However, improvements in infrastructure are lacking due to irregularities in administrative management, which result in operational problems. The saltworks also face difficulties arising from the bureaucratic procedures of environmental regulatory agencies. The manager of Saltwork 1 reported that the company has pending environmental licenses due to its proximity to a river, and that the mandatory retreat of the saltwork, as required by law, would lead to the termination of its activities.

In this context, the *Instituto de Desenvolvimento Sustentável e Meio Ambiente* (IDEMA) and the *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* (IBAMA) are viewed as slow and bureaucratic institutions. Regarding the *Agência Nacional de Vigilância Sanitária* (ANVISA), the interviewed managers agreed that it represents a partnership relationship, as it is the agency responsible for monitoring the concentration of iodine in salt, thus contributing to product quality control.

In line with these perspectives, there is a lack of partnerships with universities for the development of research and scientific studies that could enhance salt processing, which corroborates the findings of Sales (2016). The governmental absence and the union deficit inherent to the sector are identified as factors responsible for the lack of incentives for research. The aspects related to the related and supporting industries within the salt industry are represented in Figure 3.

**Figure 3**

*Related and Supporting Industries*



Source: Research data.

Contrary to the results of the analysis of the clothing cluster conducted by Lacerda et al. (2016), and in line with Sales (2016), there is a significant geographical distance between the suppliers and the salt industry. Due to this, efforts are made to maintain the flow of economic transactions by establishing a relationship of trust, especially regarding the fulfillment of delivery deadlines for purchases. In addition, tests and evaluations of inputs, such as packaging, are carried out, as they are essential for preserving the quality of salt. Furthermore, the high demand for iodine, an imported input with few suppliers available in Brazil, reduces the bargaining power in transactions, as illustrated in Figure 3.

Although the location of the saltworks is favorable in terms of basic production factors, it is disadvantageous with respect to logistics costs, since they are situated far from the regions that concentrate the largest salt buyers. In contrast to this circumstance, the managers explained that the return freight model helps balance distribution expenses, as truck drivers who transport products from the South and Southeast to the Northeast accept returning with salt cargoes at low cost.

It is important to emphasize that advisory relationships exist between the salt factories

and their client industries through quality control departments, which provide guidance regarding changes in specifications. This advisory process occurs reciprocally, since most buyers have fixed usage specifications and formulations, and the saltwork must meet these demands and produce according to the particular requirements presented.

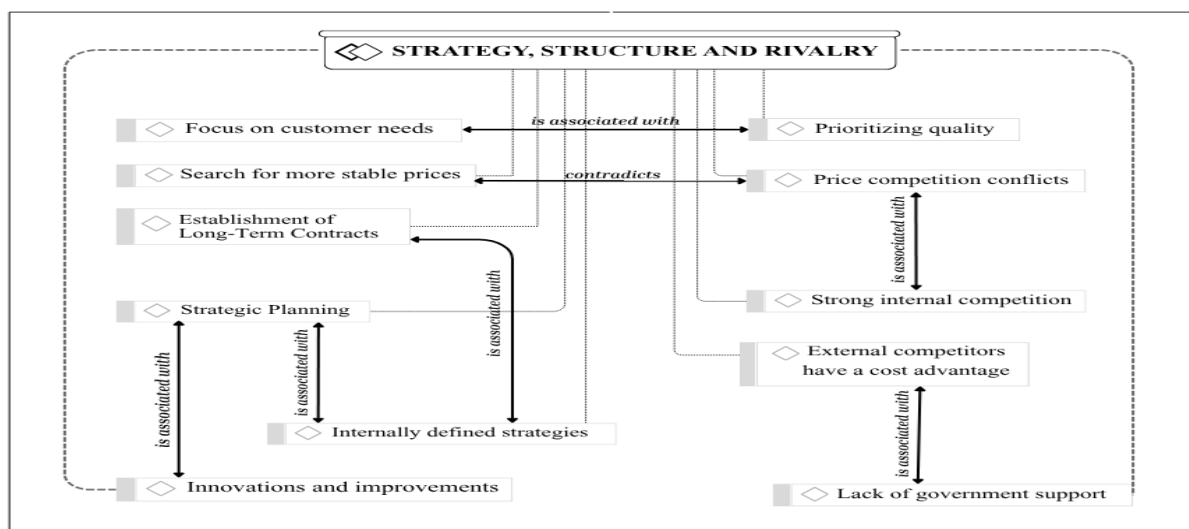
#### 4.4 STRATEGY, STRUCTURE AND RIVALRY

According to the interviewees, the strategic planning of salt industry organizations is developed internally and directs maintenance, production, inventory control, and investment policies toward meeting customer needs and expanding production capacity to increase sales, in line with the findings of the study conducted by Sales (2016). In this context, the strategies for achieving competitive success in the sector involve prioritizing salt quality, establishing long-term contracts that ensure sales revenue, seeking more stable prices to satisfy buyers, and monitoring internal competition with the goal of surpassing it through innovations and improvements that increase production efficiency, as discussed by Porter (2009).

Figure 4 presents the aspects related to Strategy, Structure, and Rivalry identified in the salt market segment, according to the interviews conducted. Contrary to the melon segment studied by Pinto et al. (2018), it was found that the attempt to maximize price stability is hindered by the conflicts arising from intense internal competition concentrated in the Northeast region, resulting from the lack of union contribution to the organization and agreements among competing rivals.

**Figura 4**

*Strategy, Structure and Rivalry*



Source: Research data.

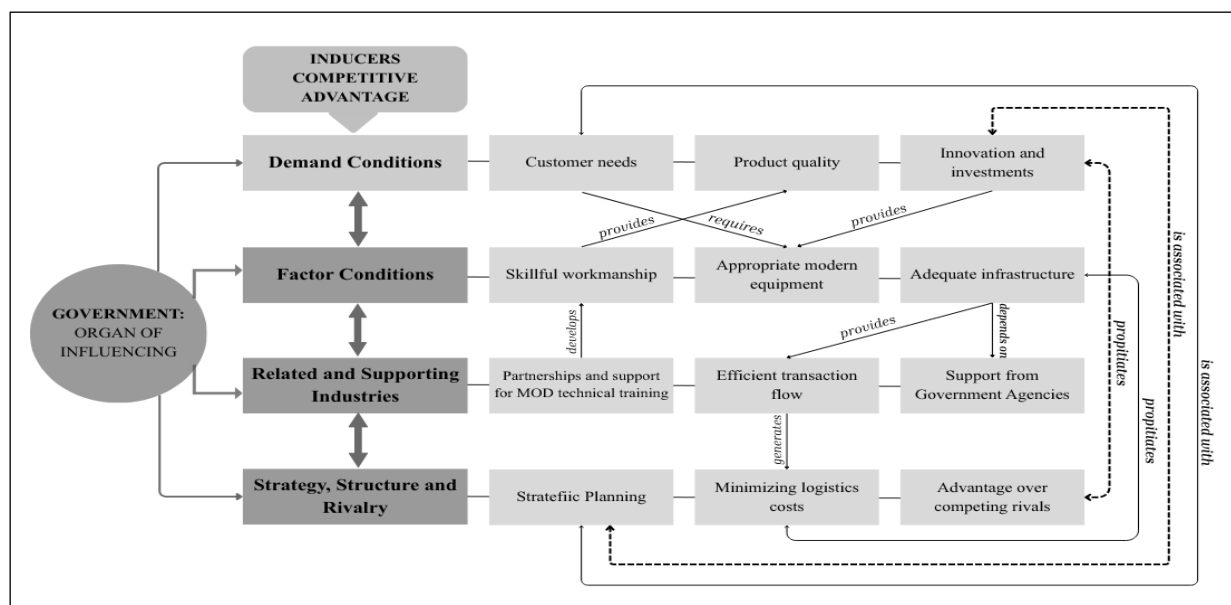
The geographic concentration of saltworks causes a decline in the market value of salt, given the competition among nearby companies for sales. However, managers state that large food industries with high-value brands prioritize the highest quality salt. For this reason, saltworks that aim for business growth and seek to gain an advantage over competitors focus on producing salt with high quality standards.

Regarding external competition, the manager of Saltwork 2 highlighted that Chile is Brazil's main foreign competitor, and due to the irregular cost conditions of the Chilean salt industry, the Brazilian salt market faces competitive disadvantages. In view of this, the manager explained that unity and cohesion among the representatives of the saltworks are necessary to pressure the government to implement measures such as the creation of tariffs on Chilean salt imported into Brazil, with the purpose of balancing the competitive conditions between Brazilian and Chilean producers.

Following the identification and analysis of the competitiveness factors in the salt industry of Rio Grande do Norte, it becomes evident that the dynamics of these aspects reveal a strong need for government support to favor the sector. Figure 5 illustrates, according to the results obtained from the present study, the schematic representation of the correlations among the four attributes of Porter's Diamond that drive competitive advantage.

### Figure 5

### *Relationship between the competitive factors of Porter's Diamond*



*Source:* Research data.

According to the schematic representation in Figure 5, demand conditions are directly related to the productive factors of the salt industry, since customer needs define the means of production, which corroborates the research of Pinto et al. (2018). Moreover, the strategic planning of saltworks is developed based on buyer requirements and is adjusted according to market demand, in association with technological innovations that provide competitive advantages.

The advanced factor conditions also depend on related and supporting industries. As shown in Figure 5, adequate infrastructure for the sector can contribute to reducing salt distribution costs and, for that purpose, requires government support regarding the implementation of construction projects and investments in transportation routes. Another dependency lies in the development of skilled labor, which is fostered through partnerships with technical and educational institutions.

Therefore, the research suggests that demand conditions foster competitiveness in the sector, as the demand for high-quality salt encourages organizations to surpass competitors' productivity levels. In addition, the factor of strategy, structure, and rivalry also contributes to competition among saltworks, due to the intense dispute for more attractive market prices and strategic planning focused on attracting customers by achieving higher quality levels in salt production.

However, the related and supporting industries, in general, do not enhance competitiveness in the salt sector due to the lack of government measures that could improve infrastructure and ensure an efficient flow of business activities. Furthermore, the small number of suppliers of specific inputs and resources generates logistical deficits and minimal bargaining power in economic transactions, which, combined with inefficient credit lines, results in high investment costs that hinder the development of advanced factor conditions, such as adequate equipment and machinery for production.

## 5 CONCLUSIONS

This research aimed to identify the competitiveness factors, in light of Porter's Diamond, in the salt industry of the state of Rio Grande do Norte. The results obtained regarding the basic factor conditions indicate that the region is promising for salt production due to the combination of high solar temperatures, constant wind currents throughout the year, low rainfall, and flat coastal areas at sea level, thus offering natural resources favorable to salt production.

Regarding advanced production factors, it was found that electricity supply is satisfactory but costly. The proximity among saltworks has led to the presence of an experienced operational workforce, and the regional shortage of suppliers of technological resources specific to the salt industry generates additional investment costs in equipment and machinery. In terms of infrastructure, management problems at *Porto-Ilha* and deficiencies in highway networks hinder the transportation of salt cargo in the region.

As for financial resources, it was identified that the credit lines available in the market are not viable for the sector due to the high interest rates charged by financial institutions. In addition, companies seek working capital mainly through discounted invoice operations.

With respect to demand conditions, it was observed that innovation in the salt industry is driven by the demanding domestic market, and the quality of the salt produced under these conditions satisfies external buyers and constitutes the main strategy for expanding production capacity, enabling the attraction of new clients and the achievement of competitive success.

The aspects related to the related and supporting industries indicate a lack of government projects and scientific studies aimed at improving the sector. Conversely, there are partnerships with technical and educational institutions that assist in workforce training. On the other hand, environmental regulatory agencies are generally perceived as slow and bureaucratic. Regarding supplier relations, it was noted that because they are geographically distant from the saltworks, trust between both parties is the main factor maintaining the flow of economic transactions. It was also observed that the lack of government support and union organization results in uncontrolled internal competition, leading to the devaluation of salt in the national market.

Concerning the conceptions of structure, strategy, and rivalry identified in the research, the saltworks studied base their strategic planning on customer needs, the intention to expand production volume, and consequently, to increase sales. Another point observed is the price instability of salt caused by intense internal competition. Thus, the companies aim to maximize the quality of salt to meet customer expectations and gain an advantage over competitors.

The relationship among the four analyzed factors revealed interdependence among them. In this sense, demand requires advanced resources that depend on supporting organizations and appropriate strategies to overcome the difficulties imposed by rivalry. The context exposes the government as an entity that influences the dynamics of the determinants of competitive advantage in the salt industry.

The original contribution of this study lies in highlighting the importance of

understanding the aspects inherent to competitiveness factors for the progress of salt industry organizations in the market. It is considered that the dynamics of the dimensions of Porter's Diamond shape the business environment, and therefore, the knowledge derived from scientific studies provides a foundation for managers to make decisions that foster competitive advantages.

In line with this, for theoretical contributions, it is essential that academic institutions, particularly in the areas of business management and strategy, explore Porter's Diamond Theory further, engaging students in studies that relate the four competitiveness factors, given the relevance of these drivers to any industry.

The practical relevance of this research is to provide an understanding of the competitive factors of the salt industry segment, offering a foundation for saltwork managers to seek improvements by demanding government projects, encouraging universities to establish partnerships with the sector, identifying what is essential to meet customer needs, recognizing that the sector's location increases logistics costs, and reflecting on how prepared saltworks are to address the aspects inherent to the identified competitiveness factors.

The main limitation of the research lies in the small sample, composed of only three companies in the salt industry of Rio Grande do Norte. This limitation restricts the diversity of perceptions and strategies within the analyzed industry. Additionally, the limited number of participants made it difficult to identify consistent patterns of competitiveness factors in the sector, thereby reducing the generalizability of the results to the entire salt industry cluster in Rio Grande do Norte. This restriction stems from the difficulty of accessing companies and the limited availability of managers to grant in-depth interviews.

In this context, future research should adopt a comparative approach between the salt industry clusters of Rio Grande do Norte and those of other marine salt-producing states. Such comparison may reveal structural, technological, and institutional differences that could influence regional and national competitiveness. Consequently, this may contribute to the formulation of more effective public policies and strategies for the salt industry.

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