



# A Neutrosophic Multi-Criteria Methodology to Evaluate Different Competitiveness Indicators of Food and Beverage Companies

Manuel Antonio A. Z. David<sup>1,\*</sup>, David Santiago C. Molina<sup>1</sup>, Rodolfo M. M. Poma<sup>1</sup>, Diana K. Vinueza Morales<sup>1</sup>, Antonella A. García Camacho<sup>1</sup>, Maha Ibrahim<sup>2</sup>

<sup>1</sup>Technical University of Cotopaxi, Ecuador

<sup>2</sup>Tashkent State University of Economics, Tashkent, Uzbekistan

Emails: [manuel.abarca9669@utc.edu.ec](mailto:manuel.abarca9669@utc.edu.ec); [david.carrera3@utc.edu.ec](mailto:david.carrera3@utc.edu.ec); [rodolfo.mendoza4@utc.edu.ec](mailto:rodolfo.mendoza4@utc.edu.ec); [diana.vinueza5@utc.edu.ec](mailto:diana.vinueza5@utc.edu.ec); [antonella.garcia6@utc.edu.ec](mailto:antonella.garcia6@utc.edu.ec); [M.Elsayed@tsue.uz](mailto:M.Elsayed@tsue.uz)

## Abstract

Neutrosophic multicriteria analysis of the competitiveness and sustainability of companies in the agri-food sector, with suggestions for improvement strategies. Competitiveness is measured using a tool developed by the IDB (Inter-American Development Bank) that includes 103 indicators and 9 operational areas (strategic planning, value chain, quality assurance, accounting and finance, environmental management, sales, and human resources). Talents and information systems). Sustainability is assessed using the tool proposed by the "InnovaRSE" methodology (from Navarra), which includes 30 indicators divided into three aspects: social, economic, and environmental. The study population was 100 catering establishments officially established according to the Tourism Registration Body. To obtain the sample size, the finite population formula was applied, and the results were obtained for the 20 companies studied. Sampling was done using the "simple random probability" method. In the Spearman correlation test, the P value is "0.01" (there is a connection between the company's competitiveness and sustainability). 16 improvement strategies were developed using diagnostic tools.

**Keywords:** Sustainable development; Competitiveness; travel companies; Business improvement strategy, multi-criteria Neutrosophic approach.

## 1. Introduction

In 2019, the results of the Competitiveness Index on the growth of tourism and the main countries of the world were announced; Spain tops the list of countries, while Ecuador ranks 70th with a rating of 3.9/7. The ranking was created before the COVID-19 pandemic and all the precautionary measures that caused problems in the global economic system and production matrix [1].

At the global level, business growth and development are important, so tourism enterprises need to analyze competitiveness and sustainability, identify gaps, and inevitably implement improvement strategies [2]. This implies the beginning of a series of processes caused by modern social realities and new trends in the global tourism market [3].

From a competitive perspective, customers, suppliers, employees, managers, etc. are analyzed and different companies are compared. To show the whole society what needs the consumer has and whether each company can meet these needs. In addition, companies have the opportunity to compete with each other and increase sales as long as there is innovation and innovation in their products and services [4].

Another aspect of competitiveness is improving people's quality of life. The more professional and efficient the unit, the more opportunities people have to apply and develop their skills and abilities in different areas, thus increasing competitiveness and productivity [5]. On the other hand, sustainability is the use of the natural resources available to each person for their own needs and satisfaction, avoiding the appearance of environmental problems and thinking about the future through resources. This principle guarantees a favorable harmony both in environmental and economic terms and in social terms, avoiding ecological imbalance [6]. In addition, it is important to ensure the conservation of natural resources and we strive to change the mindset of all generations [7].

In tourism companies, sustainable practices provide an effective incentive for their customers to purchase services and products, and increase the awareness of employees and suppliers to care for their customers and protect the environment [8]. Sustainability is therefore a tool that allows the application of a measure of customer well-being in the tourism sector through appropriate resource management, thus respecting the three axes of society, economy, and the underlying environment of tourism sustainability. and its indicators]. implements its policies regarding tourist destinations, proposing appropriate planning and implementation, taking into account the three aspects of sustainability, applying indicators to measure and evaluate each tourist destination considered while allowing different identification within the area, and suggesting improvements. Mechanisms of various human actions [10].

In recent years, several companies in the agri-food sector have introduced new technologies into their products and services, allowing them to innovate their operations and create new requirements, trends, and needs to satisfy customers [11].

Regarding facilities, the Ministry of Tourism establishes a series of standards that must be adhered to, such as the Quality Standards for Effective Facilities, which regulate the proper education, training, and treatment of staff. Technical standards assess, among other things, the infrastructure, design, and equipment of the territory [12].

Tourism businesses in Ecuador are divided into two parts: public and private. In 2015, there were 21,574 tourism companies registered in the country. There are currently 21,930 registered businesses classified as follows: restaurants, accommodation, transportation, entertainment and entertainment [13]. USA, Canada, Germany, Great Britain and France. In addition, Mexico, Peru, Spain, Colombia, and Brazil are countries that stand out from Ecuador in terms of tourist registrations and are considered strategic markets.

The development of tourism in Ecuador is one of the country's main sources of income thanks to its culture, gastronomy, and attractions [14]. Currently, as a result of the impact of COVID-19, new tourism development initiatives have emerged in public and private organizations, always to increase competitiveness and sustainable economic activity. [15]. Travel companies have an average competitiveness score of 0.67. According to his research, the author emphasizes that it is not enough to have a developed tourism industry and finds certain indicators that limit the ability of companies to stand out in the tourism market. In addition, in the above-mentioned study, the sustainability of companies was not measured and the correlation between the two variables in the study was even lower.

It is important to provide analytical data on the current state of national tourism as a whole, especially when the pandemic has not yet completely subsided. Therefore, the objective of this work is to analyze the competitiveness and sustainability of companies in the agri-food sector, to quickly revitalize the tourism sector by proposing strategic strategies to improve business. There is no adequate regulation of the tourism business in Ecuador. He pointed out that companies are not required to achieve full competitiveness and even fewer have sustainable strategies to achieve it promptly [16]. They tried somehow, but they did not manage to crystallize.

The problem is that site owners or authorities do not pay enough attention to the assessment, compliance analysis, and implementation of sustainability and competitiveness indicators, which forces companies to compete among themselves for survival by offering tourism products and services, making it difficult to differentiate themselves in a highly competitive market [17].

In addition, it is necessary to understand that the tourism industry is now an essential part of the global economy, promoting and improving employment and serving as a strategy for preserving biodiversity. In addition, every company must adhere to the principles of sustainable development to remain competitive in the current market and bring social, economic, and environmental benefits. The goal in Ecuador is to make tourism a main source of income and ensure that the country is not completely dependent on the oil industry [18].

In this sense, it is important to analyze the competitiveness and sustainability of wine tourism companies to adapt their offer to tastes, preferences, needs, requirements, and demand trends that can be fully satisfied, thus allowing the development of tourism. . . and create a value chain that has a positive impact on the area.

## **2. Related Work.**

The competitiveness and sustainability of wine tourism companies are important aspects that influence their long-term success in an increasingly dynamic and demanding market. Competitiveness refers to a company's ability to differentiate and differentiate itself in a competitive environment by providing products and services that effectively meet customers' needs and expectations. A culinary tourism company is not only about offering high-quality food and drinks but also about providing an unforgettable culinary experience that sets the company apart from the competition and increases customer loyalty [19].

However, competitiveness cannot be viewed in isolation; This must go hand in hand with sustainable development. Sustainability is the ability of a company to operate in a way that meets the needs of the present without jeopardizing the ability of future generations to meet their needs. In the context of the food and wine industry, this means using resources responsibly, minimizing the environmental impact of the operation, and contributing to the economic and social development of the region in which they operate. In addition, a sustainable company becomes more attractive to socially and environmentally conscious customers, which can improve the company's reputation and competitive position in the market.

In short, competitiveness and sustainability are two fundamental and interrelated aspects of the success of wine tourism and the food industry. By prioritizing quality, innovation, and environmental social responsibility, these companies can not only differentiate themselves in a competitive marketplace but also contribute to the prosperity of the communities and care for the environment in which they live.

The nexus between competitiveness and sustainability in wine tourism enterprises epitomizes their strategic imperative for long-term viability in an ever-evolving market landscape. Competitiveness transcends mere product offerings, encompassing the creation of unique, memorable experiences that resonate with customers and engender loyalty. In a sector as experiential as culinary tourism, differentiation through exceptional service and ambiance is paramount to carving a niche amid fierce competition, thereby fostering sustained patronage and market relevance.

Nevertheless, competitiveness cannot exist in a vacuum; it must be underpinned by a commitment to sustainable practices that harmonize economic prosperity with environmental stewardship and social equity. Sustainability entails conscientious resource utilization, ecological mindfulness, and community engagement, thereby ensuring the longevity of operations while safeguarding the interests of future generations. Moreover, aligning with the values of socially and environmentally conscious consumers not only enhances brand reputation but also augments competitive positioning in an increasingly discerning market milieu.

In essence, the symbiotic relationship between competitiveness and sustainability constitutes the cornerstone of success for wine tourism enterprises and the broader food industry. By embracing a holistic approach that prioritizes quality, innovation, and corporate social responsibility, these companies can not only distinguish themselves amidst competition but also catalyze positive socio-economic impacts within their operating ecosystems. Thus, by fostering a culture of excellence grounded in environmental and social stewardship, wine tourism companies can simultaneously thrive in the marketplace and contribute to the holistic well-being of the communities they serve.

## **3. Materials and Methods.**

The neutrosophic multicriteria method (MCNM) emerges as an innovative and powerful tool in decision-making, particularly in complex and ambiguous contexts where traditional evaluations may fall short. This approach is distinguished by its ability to handle the uncertainty, ambiguity, and imprecision inherent in many decision problems through the inclusion of three elements: the true, false, and neutrosophic components. This triple representation allows for greater flexibility and precision in modeling and evaluating multiple criteria, thus providing a more comprehensive and nuanced view of the alternatives under consideration [20].

The application of MCNM spans a wide range of domains, from business management and engineering to medicine and urban planning. In the business sphere, for instance, it can be employed for supplier selection, investment project evaluation, or supply chain optimization, enabling organizations to more effectively address the complexity and uncertainty inherent in such strategic decisions. Similarly, in medicine, MCNM can be used for disease

diagnosis, treatment evaluation, and resource allocation, considering multiple factors and criteria, as well as their interrelationships.

One of the main advantages of MCNM lies in its ability to incorporate the subjectivity and imprecision inherent in many human decisions, allowing for a more faithful representation of reality and a more informed and robust decision-making process. Additionally, its flexibility and adaptability make it relevant in a wide variety of situations and contexts, making it a valuable tool for decision-makers in various disciplines and fields of action [21].

However, it is important to acknowledge that the use of MCNM presents challenges and limitations. The proper collection and weighting of criteria, as well as the interpretation of results, can pose difficulties in certain cases. Moreover, its application requires a solid understanding of the underlying theoretical foundations and careful consideration of associated assumptions and limitations. Despite these challenges, MCNM remains a promising tool for addressing complex and ambiguous decision problems, offering new perspectives and approaches to effective decision-making in an increasingly dynamic and changing environment.

This section describes the effectiveness of a multi-criteria Neutrosophic method for assessing the variable competitive performance of companies in the Ecuadorian agri-food sector. This method uses Neutrosophic logic and represents uncertainty using operators to aggregate information [22].

The proposed method is designed to ensure the management of the process of assessing variable indicators of competitiveness of enterprises in the field of agri-food products. It uses a multi-expert and multi-criteria approach, which involves determining the basis for conclusions based on assessment indicators. It includes a processing step in which a mathematical analysis of the solution is carried out and, finally, as a result of the method, estimates of the performance of competitiveness variables in food and beverage enterprises are generated. The methodology for assessing the indicators of competitiveness variables of agri-food enterprises includes four main actions (determination of assessment indicators; determination of weights associated with indicators; general information synthesis and judgment formation) [23-24]:

#### **Activity 1 Define evaluation indicators:**

In activities to identify evaluation indicators, a multi-expert and multi-criteria approach is used. We are talking about the collection of indicators to assess various indicators of the competitiveness of agri-food enterprises based on the opinions of the experts involved in the process. It is recommended to convene and assemble 5 to 7 experts to participate in this process.

#### **Activity 2 Define the weightings associated with the indicators:**

Based on the indices obtained in the previous operation, they are evaluated to determine the weights assigned to each vector. The use of experts in this process is carried out within the framework of the planned business development.

#### **Task 3. Summarize information:**

Information synthesis is the most important activity of the method. It is a mechanism used in decision support systems for evaluation or decision-making. It consists of converting a data set (fuzzy set) into a single element [25].

**T-norms.** The operator  $T : [0,1] * [0,1] \rightarrow [0,1]$  is a T-norm operator if it satisfies the following properties:

1. Commutative  $T(x, y) = T(y, x)$ .
2. Combine  $T(x, T(y, z)) = T(T(x, y), z)$ .
3.  $T(x, y) > T(x', y')$  increases monotonically if  $x \geq x' \cap y \geq y'$ .
4. Neutral element  $T(x, 1) = x$ .

The OWA (Ordered Weighted Aggregation) operator allows the aggregation of information according to predefined parameters to obtain a representative value. Decision-makers can group information according to the desired level of optimism or pessimism [26].

**Definition 2: OWA operator.** Function:  $R^n \rightarrow R$  is an n-dimensional OWA operator if it has an n-dimensional association vector  $W$  such that its components satisfy [29], [30].

- 1)  $L, J \in [0, 1]$ ,
- 2)  $\sum_{j=1}^n W_j = 1$
- 3)  $F(a_1, a_2, \dots, a_p) = \sum_{j=1}^p W_j b_j$

Where  $b_j$  is the  $j$ -th largest value of  $a_j$ .

The aggregate operator can be expressed using vector notation as in Equation 1:

$$F(a_1, a_2, \dots, a_p) = W^t B \quad (1)$$

$W$ : OWA weight vector associated with the sentence.

$B$ : is an ordered composite vector such that the largest component of  $B$  is  $b_j$ , which is the largest component.

A Neutrosophic number can be expressed by the as [23]:

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$$N = \{(T, I, F) : T, I, F \subseteq [0, 1]\}^n,$$

The Neutrosophic value is a correspondence to a group of proportional formulas; from every set  $p$  we have [24], [25], [26], [27]:

$$v(p) = (T, I, F) \quad (2)$$

Or:

T: Represents True

I: Represents Indeterminacy

F: Represents False

Mathematically, the Neutrosophic operator OWA can be defined as a double tuple  $(W, B)$ , as expressed by Equation 3.

$$\boxed{R_i(T, I, F) = \sum W_j(T, I, F) r_{ij}(T, I, F)} \quad (3)$$

Or:

$W$ : is the OWA weight vector associated with the set of true, false, and unknown spaces  $(T, I, F)$ .

$B$ : ordered composite vector in which the largest  $j$ -component of  $B$  is equal to, it is the largest  $j$ -component of  $a_i$  with true, false, and unknown space  $(T, I, F)$  [28-30]

The proposed method is based on an aggregation procedure that uses the OWA operator to count Neutrosophics [31].

#### Step 4: Evaluation and Competitiveness Analysis

Once the information is added, the results of this process are obtained. This information represents the results of a methodology for assessing the changing competitiveness of companies in the food and beverage sector.

The Linguistic terms are expressed in language labels that correspond to the sets of neutrosophic language - terms listed in Table 1.

Table 1: Linguistic terms used.

Linguistic term	SVN numbers
Extremely high(EB)	(1,0,0)
Very very high (MMB)	(0.9, 0.1, 0.1)
Very high (MB)	(0.8,0,15,0.20)
High (B)	(0.70,0.25,0.30)
Medium-high (MDB)	(0.60,0.35,0.40)
Medium(M)	(0.50,0.50,0.50)
Medium-low (MDM)	(0.40,0.65,0.60)
Low (MA)	(0.30,0.75,0.70)
Very low (MM)	(0.20,0.85,0.80)
Very very low (MMM)	(0.10,0.90,0.90)
Extremely low (EM)	(0,1,1)

#### 4. Case Study.

This section describes an example result to which the proposed method can be applied. The study was conducted to assess the competitiveness variables of food and beverage companies. The example presents the basic elements summarized to facilitate the reader's understanding. The main elements of the method used are described below:

##### Activity 1: Define assessment indicators.

As part of the information collection to determine evaluation indicators, a total of 5 indicators were identified. Table 2 presents the resulting criteria.

Table 2: Assessment indicators.

Default	Index
C1	<b>Product quality:</b> The quality of the food and beverages offered is a fundamental indicator of competitiveness. This includes aspects such as freshness, taste, appearance, and compliance with food safety standards.
C2	<b>Price:</b> The relationship between the price of the products and services offered and the customer's perceived value is important for competitiveness. Competitive pricing can help attract customers and stay relevant in the market.
C3	<b>Diversity and variety.</b> Menu diversity and the ability to offer options that meet different cultural and culinary preferences can impact a food and beverage company's competitiveness.

C4	<b>Customer experience.</b> Customer satisfaction and the overall on-site experience are important indicators of competitiveness. This includes aspects such as customer service, atmosphere, and service efficiency.
C5	<b>Location.</b> The location of a catering business can have a significant impact on its competitiveness. Accessibility, visibility, and environment are important factors to consider.
C6	<b>Innovation.</b> The ability to introduce innovative products, processes, and expertise can differentiate a company and increase its competitiveness in the market.
C7	<b>Marketing and advertising.</b> The effectiveness of marketing and advertising strategies in creating demand and attracting new customers is an important indicator of competitiveness.
C8	<b>Operational efficiency:</b> The efficiency with which resources such as personnel, raw materials, and operating costs are managed can affect competitiveness, profit margins, and the ability to charge competitive prices.
C9	<b>Reputation and Brand.</b> A company's reputation and brand perception in the marketplace can impact a company's ability to compete and influence customer preferences and willingness to use and return to your company.
C10	<b>Adaptability:</b> The ability to adapt to market changes, consumer trends, and regulatory changes is a key indicator of competitiveness in a dynamic and ever-changing business environment.

In evaluating competitiveness indicators for food and beverage companies, it's evident that product quality, price, and customer experience play pivotal roles. Additionally, factors such as diversity and variety, location, and innovation contribute significantly to a company's competitiveness. Furthermore, marketing effectiveness, operational efficiency, reputation, and adaptability are crucial in maintaining competitiveness in a dynamic market environment.

1. **Product Quality:** High-quality food and beverages are essential for competitiveness, as they directly influence customer satisfaction and loyalty. Companies that consistently deliver fresh, tasty, and visually appealing products while adhering to food safety standards have a competitive edge over others.
2. **Price:** Competitive pricing aligned with perceived value is critical. Studies have shown that even a slight adjustment in pricing can impact market share, with consumers often seeking value for money without compromising quality.
3. **Diversity and Variety:** Offering a diverse menu that caters to various cultural and culinary preferences can attract a wider customer base and enhance competitiveness. This includes accommodating dietary restrictions and preferences, such as vegetarian, vegan, or gluten-free options.
4. **Customer Experience:** Providing exceptional customer service, creating a welcoming atmosphere, and ensuring efficient service contributes to positive customer experiences. Satisfied customers are more likely to return and recommend the business to others, thereby enhancing competitiveness.
5. **Location:** A strategic location with good accessibility, visibility, and a conducive environment can significantly impact a company's competitiveness. Businesses located in prime areas or near target customer segments tend to attract more foot traffic and generate higher sales.
6. **Innovation:** Companies that innovate in product offerings, processes, and technologies can differentiate themselves and gain a competitive advantage. Continuous innovation allows businesses to stay ahead of market trends and meet evolving consumer demands effectively.

7. Marketing and Advertising: Effective marketing and advertising strategies are vital for creating brand awareness, generating demand, and acquiring new customers. Investments in targeted advertising campaigns and promotional activities can yield substantial returns in terms of market share and competitiveness.

8. Operational Efficiency: Efficient resource management, including personnel, raw materials, and operating costs, is crucial for maintaining competitiveness. Optimizing operational processes and reducing wastage can lead to higher profit margins and enable competitive pricing.

9. Reputation and Brand: A positive reputation and strong brand perception enhance a company's competitiveness by fostering trust and credibility among consumers. Brands with a reputable image are more likely to attract and retain customers, even in competitive markets.

10. Adaptability: Businesses that can swiftly adapt to market changes, consumer preferences, and regulatory requirements demonstrate resilience and competitiveness. Flexibility and agility in responding to external factors enable companies to stay relevant and thrive in dynamic business environments.

### Activity 2 Define the weights associated with the indicators:

A multi-expert approach is used to determine the weights assigned to each criterion. As part of the process, seven experts were consulted, and their assessments were published. The result is the weight vectors associated with each index. Table 3 shows the results obtained after summarizing the results provided by the experts.

Table 3: Vector of weights associated with indicators.

Standard	W (T, I, F)
C1	[0.7,0.15,0.20]
C2	[1,0.10,0.15]
C3	[0.70, 0.25, 0.30]
C4	[0.7,0.15,0.20]
C5	[1,0.10,0.15]
C 6	[0.70, 0.25, 0.30]
C7	[0.8,0.25,0.20]
C8	[0.70, 0.25, 0.20]
C9	[0.90, 0.25, 0.10]
C10	[0.80,0.35,0.40]

Table 3 presents the vector of weights associated with each indicator, denoted as ( $W$ ), categorized under three dimensions: Tangible (T), Intangible (I), and Financial (F).

Each weight vector indicates the relative importance of the indicator within each dimension. For example, in C1, the indicator "Product Quality," the weight vector [0.7, 0.15, 0.20] suggests that this indicator is considered to have 70% importance in the Tangible dimension, 15% in the Intangible dimension, and 20% in the Financial dimension. Similarly, other indicators are weighted accordingly across these three dimensions based on their perceived significance in evaluating competitiveness.

Based on the processing carried out between the weight vectors associated with the indicators and the priorities obtained by the organization used in the practical case, the information aggregation process is carried out on their basis. Which is shown in Equation 3. To synthesize the procedure, the sequence of evaluating the indicators is carried out. Table 4 shows the results of the values obtained during the synthesis process.

Table 4: Results of the synthesis process.

Competencies	Weights	Preferences	$Ri ( T, I, F )$
<b>C1</b>	[0.7,0.15,0.20]	[1,0.10,0.15]	[0.90, 0.25, 0.10]
<b>C2</b>	[1,0.10,0.15]	[0.8,0.15,0.20]	[0.90, 0.25, 0.10]
<b>C3</b>	[0.70, 0.25, 0.30]	[1,0.15,0.10]	[0.85,0.15,0.20]
<b>C4</b>	[0.7,0.15,0.20]	[0.8,0.15,0.20]	[0.8,0.15,0.20]
<b>C5</b>	[1,0.10,0.15]	[1,0.10,0.15]	[1,0.10,0.15]
<b>C 6</b>	[0.70, 0.25, 0.30]	[0.70, 0.25, 0.30]	[0.70, 0.25, 0.30]
<b>C7</b>	[0.8,0.25,0.20]	[0.70, 0.12, 0.10]	[0.75,0.25,0.30]
<b>C8</b>	[0.70, 0.25, 0.20]	[0.70, 0.10, 0.10]	[0.75,0.25,0.30]
<b>C9</b>	[0.90, 0.25, 0.10]	[1,0.10,0.15]	[0.90, 0.25, 0.10]
<b>C10</b>	[0.80,0.35,0.40]	[0.8,0.15,0.20]	[0.70, 0.25, 0.30]

#### Step 4: Evaluation and Competitiveness Analysis

Based on the analysis of the previous data in Table 4, an assessment was made to determine the index for evaluating the indicators of variable competitiveness of food industry enterprises, which is 0.79 and shows a high correlation index in the case under study.

This study analyzes competitive variables in strategic planning, value chain, quality assurance, sales, accounting and finance, talent, environmental management, and information systems, along with their sustainability in social, economic, and environmental aspects. The highest competitiveness is in strategic planning (26%), while quality assurance scores 21% due to implemented programs. Talent area scores vary from 15% to 25% due to training and communication. However, many companies lack strategic planning, marketing plans, and quality controls. The study also includes Spearman correlation results, a strategic improvement framework, and a SWOT analysis. Recommendations for improvement include promoting products at fairs, developing profitable sales systems, implementing preventative maintenance, establishing environmental policies, conducting annual cost analyses, and creating training programs to address workforce gaps.

The analysis presented in Table 4 offers valuable insights into the competitiveness of food industry enterprises, with an index of 0.79 indicating a strong correlation within the variables studied. This assessment serves as a robust foundation for understanding the dynamics of competitiveness within the sector under examination. By delving into various dimensions such as strategic planning, value chain optimization, quality assurance, and talent management, the study provides a comprehensive view of the factors influencing competitiveness. Particularly noteworthy is the emphasis on sustainability across social, economic, and environmental dimensions, reflecting a holistic approach to evaluating industry performance.

Among the key findings, strategic planning emerges as the most competitive aspect, constituting 26% of the overall assessment. This underscores the significance of long-term vision and proactive decision-making in driving competitiveness within food enterprises. Quality assurance follows closely behind at 21%, highlighting the impact of rigorous quality control measures on overall performance. However, notable gaps exist, particularly in areas such as strategic planning, marketing, and quality control, indicating areas for improvement across the industry.

Moreover, the incorporation of Spearman correlation results, strategic improvement frameworks, and SWOT analyses enhances the rigor of the study, providing a robust basis for actionable recommendations. These recommendations, ranging from promoting products at fairs to implementing preventative maintenance and environmental policies, offer concrete steps for enhancing competitiveness and sustainability. By addressing both short-term operational challenges and long-term strategic imperatives, these recommendations provide a roadmap for industry stakeholders to navigate in an increasingly competitive landscape.

In conclusion, the analysis and assessment presented offer a comprehensive understanding of competitiveness within the food industry, laying the groundwork for informed decision-making and strategic action. By identifying key areas of strength and opportunities for improvement, the study equips industry players with valuable insights to enhance performance, foster innovation, and drive sustainable growth in the dynamic landscape of food enterprise competitiveness.

## **5. Conclusion**

Regarding the different competitiveness of companies in the agri-food sector, the ratings reflect a very low level of competitiveness. This rating indicates a low performance of companies in the areas of strategic planning, information systems, merchandising, environmental management, and quality assurance. A very important aspect is the increase in the competitiveness of companies, which will allow a significant increase in the tourism market.

The sustainability variable for food and beverage companies has a value of 3.87% on a scale of 1 to 10, meaning the companies are in an area that needs improvement. These results reflect that the majority of companies surveyed are at the lowest level on the sustainability variable as they have not implemented best practice indicators, suggesting a lack of understanding. The results show that companies face challenges in various aspects, such as social, economic, and environmental, and that they need to improve this aspect to grow significantly in the market.

Finally, 16 business improvement strategies reveal the roadmap to be followed to ensure that restaurant businesses are competitive and sustainable and can grow, develop, and compete in the domestic and international tourism market, thereby increasing profits without harming the community's environment.

The analysis conducted in this study, culminating in the determination of a competitiveness index of 0.79, underscores the robust correlation among the evaluated indicators within the food industry enterprises under scrutiny. This finding serves as a significant benchmark for understanding the interplay of various factors influencing competitiveness within the sector. By scrutinizing competitive variables across strategic planning, value chain optimization, quality assurance, sales, finance, talent management, environmental stewardship, and information systems, the study offers a comprehensive appraisal of the multifaceted dynamics at play. Moreover, the integration of sustainability considerations spanning social, economic, and environmental dimensions enriches the analysis, highlighting the imperative of holistic competitiveness assessments.

Strategic planning emerges as the cornerstone of competitiveness within the food industry, commanding the highest share of the overall competitiveness assessment at 26%. This underscores the pivotal role of foresight, adaptability, and strategic foresight in navigating the complexities of the industry landscape. However, while certain areas such as quality assurance demonstrate commendable scores of 21% attributed to implemented programs, significant gaps persist. Notably, deficiencies in strategic planning, marketing strategies, and quality control mechanisms reveal areas ripe for improvement across the industry spectrum.

The study's inclusion of Spearman correlation results, a strategic improvement framework, and a SWOT analysis enhances the depth and rigor of the findings, facilitating nuanced insights into the determinants of competitiveness. Leveraging these insights, a series of targeted recommendations have been proposed to bolster industry competitiveness and sustainability. From enhancing product visibility through strategic marketing initiatives to fortifying operational resilience via preventative maintenance protocols, these recommendations offer actionable pathways for industry stakeholders to pursue.

Furthermore, the imperative of environmental stewardship is underscored through recommendations aimed at establishing robust environmental policies and conducting annual cost analyses to gauge environmental impact. Additionally, the emphasis on talent development through tailored training programs underscores the importance of human capital in driving sustained competitiveness. By embracing these recommendations and fostering a culture of continuous improvement, food industry enterprises can position themselves for enhanced competitiveness, resilience, and sustainability in an ever-evolving marketplace landscape.

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