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Does Employee Training in Sustainable Practices and Food Waste Influence a Restaurant's Level of Sustainability-Oriented Service Innovation (SOSI) and Brand Equity? Evidence-Based Research into the Ecuadorian Catering Industry

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Abstract: Restaurant segmentation is an effective tool for decision-making when developing business strategies. The objective of this research is to classify restaurant groups according to the level of employee training in sustainable practices and food waste, and to contrast the differences in the degree of sustainability-oriented service innovation and brand equity, as well as in the implementation of various sustainable practices. A cluster analysis was conducted with 300 restaurants in Guayaquil, Manta, and Portoviejo in Ecuador, based on face-to-face interviews with their managers, and then confirmed with discriminant analysis. Two groups were identified: (1) restaurants with less training in green practices, higher level of food waste, lower level of sustainability-oriented service innovation, and higher brand equity; (2) restaurants with more training in green practices, lower level of food waste, higher level of sustainability-oriented service innovation, and lower brand equity. The most sustainable restaurants claim to have less brand equity, which demonstrates that the Ecuadorian consumer does not particularly value sustainability.

Keywords: segmentation; restauration; cluster analysis; discriminant analysis; sustainability

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1. Introduction

In recent years, business decisions worldwide have been influenced by the growing trend of environmental sustainability [1]. This is because the increasing competition in many sectors, as well as climate change, have made it necessary for companies to adopt a business strategy with an ecological approach that allows them to be competitive in the sector in which they operate [2,3].

Adopting an environmentally sustainable approach is a challenge for service sector establishments since, by consuming a large volume of natural resources, they exert significant pressure on the environment and must subsequently implement practices to reduce the carbon footprint [4]. Therefore, sustainable food consumption is a priority [5] as the waste of resources generated is ecologically and economically unsustainable [6]. Worldwide, one third of the food produced is wasted every year [7], generating approximately 7% of greenhouse gas emissions according to the United Nations report [8], which has led to food waste being considered as a pressing concern that governments and various industries around the world must tackle [9].

The issue of food waste represents a great challenge for the hospitality industry [10]. However, despite the gravity of the situation and its global reach [11–13], there are still few studies that address this problem in the restaurant industry [7,12].

One of the main environmental issues in restaurants is limited knowledge of current sustainability-oriented service innovation alternatives, which restricts their capacity to achieve a competitive advantage in the market in which they operate [11,14,15]. In this regard, reference is made to the interest of this topic for academics, legislators, and business owners, since they recognize the importance of using sustainable practices in their operations, both to solve the environmental problem and to take advantage of brand promotion opportunities [16].

The positioning of an eco-friendly brand is also a competitive differentiator, since it allows the consumer to associate the company with environmentally responsible behavior and improve their perception of the service [17]; in practice, a brand is more than a name and is built on the experience it provides for the consumer [18].

Regarding a company's success in adopting an ecological approach, it has been highlighted that this depends on its workforce, since employees manage food waste and implement other green practices [19,20]. Therefore, it is essential that restaurant owners and/or managers encourage environmentally responsible behavior so that employees follow their example of commitment and respect for the resources used, leading to effective environmental behaviors [21]. They should also provide ongoing training in sustainable practices [22]. Environmental sustainability in restaurants is related to several individual factors, such as food waste management, employee training, sustainability-oriented service innovation, and brand equity, whose relationships have received little attention in the literature to date [17]. It is worth mentioning that although there is research linking certain green practices in restaurants, such as food waste management and employee training, e.g., [5,10], there is currently no study that classifies restaurants in relation to food waste and staff training in environmental management, based on their level of sustainability-oriented service innovation and their brand equity, particularly in the context of less developed countries.

The objective of this research is to identify restaurant groups based on level of training in green practices and food waste, and to analyze existing differences in terms of the sustainable practices implemented and brand equity for the consumer.

1.1. Food Waste in Restaurants

Food waste in restaurants is defined as the wastage of any food at any stage of production, generated throughout the supply chain [23].

The generation of this waste represents a significant loss of resources such as land, water, labor, and energy [24,25], causing social, economic, and environmental impacts [8,25,26]. In addition, the fact that food is wasted on such a large scale means that millions of people do not have enough to eat, especially in developing countries [26].

All this has led to great social, environmental [4], political [27], institutional, and academic [28] concerns, which in turn have given rise to a series of studies, reports, policies, standards, and proposals for improvement to understand the reality of waste and achieve its reduction. Specifically, over the past decade, policymakers, practitioners, and researchers have demonstrated their interest in mitigating food waste through several proposals such as: color coding of the refrigerator, labeling of products and provision of information, adjusting portion and plate sizes, changing menus and nutritional guidelines, and redesigning the curriculum, among others [28].

The solution is not achieved by modernizing the logistical and technological structures of production, but by changing the irrational economic system fostered by capitalism [27]. In this way, mitigation is only possible if managers and employees understand the moral dimensions and the resulting negative social and environmental impacts [26], and national governments take steps to promote this awareness through free specialized training on how to reduce kitchen food waste [29].

Effective food waste management requires a clear understanding of the factors that cause this waste and the benefits of its reduction, from which efficient strategies can be explored,

prioritized, and implemented [30]. Within the restaurant, the main causes of food waste are inadequate handling of food by staff, inefficient inventory control, and deficiencies in staff training in food waste management [5], generating, as a consequence, a potential negative effect on the environment and human health [31]. Furthermore, the lack of planning for both inventory supply and production leads to inaccuracies that become waste [26].

Food waste is not only produced by restaurant employees but also by consumers, and, therefore, must be investigated as two separate sources of waste. Although consumer waste has been the focus of multiple investigations, e.g., [30,32–34], these investigations do not delve into the causes behind this behavior but instead offer possible solutions to avoid and/or reduce waste, such as creating incentives for consumers to specifically decide the amount of food they want [34]. However, despite waste reduction programs and the implementation of policies and incentives, consumer food waste remains a challenge without an effective solution [32] given that the attitudes and behaviors that drive this action on the part of the diner remain unknown [35].

It is worth mentioning that the avoidable wastage of food generated in the logistics chain of restaurants is a strategic problem that impacts financial health [35,36] due to the increase in operating costs, in view of which, the manager's ability to minimize waste and use resources in the most efficient way possible is one of the most relevant factors [36].

1.2. Employee Training in Environmental Management

Employee training in environmental management involves the implementation of mechanisms for employees to practice eco-friendly behaviors, exhibiting values that align with the company's environmental sustainability objectives [4], so that these behaviors are voluntary and not forced [20]. Ecological training provides employees with a heightened awareness of the relationship between the company and the environment, which encourages environmental respect and commitment [37].

The aim of staff training in environmental practices is to promote efficient management of the supply chain, which is why the topics taught during training must be updated, rooted in training needs and the practicality of knowledge to be implemented in daily activities [38], with priority given to training on proper food handling, hygiene, and service of prepared foods [10].

The hotel industry has demonstrated the importance of its employees conducting efficient and eco-friendly management of human resources, since, in addition to other benefits, it facilitates a quality work environment and a solid competitive position accompanied by effective economic performance [39].

Employee training is a factor that restaurants can control as it is a part of their operations, and therefore they must focus their efforts on making it better [40]. This contrasts with external factors such as laws and regulations, suppliers, and pressure from stakeholders, which, although they play a significant role in their ecological transition, are not controllable. Considering the pressure that these external factors exert on the green practices of restaurants, mainly so that they can timely manage one of the most serious problems for environmental sustainability—food waste—the literature has indicated that green training of staff is one of the most used practices due to its influence in mitigating this problem [3,10,13,17].

1.3. Sustainability-Oriented Service Innovation (SOSI)

Sustainability and sustainable development at the business level has become a topic of great interest to policymakers, industrial organizations, and academics [41], which is why numerous studies point to innovation as a determining factor to achieve this development [11,14,42–44]. This gives rise to concepts such as sustainability-oriented innovation (SOI), from which sustainability-oriented service innovation (SOSI) originates, representing a significant advance at the academic level, although the evidence from studies is still scarce.

In this context, it is important to define SOI to achieve a better understanding of the topic addressed in the research. SOI is conceptualized as a subset of innovation that focuses on maximizing profits and minimizing the consequences of social and environmental damage [45]. This concept addresses concerns about environmental, social, and economic sustainability [44], since it requires multiple efforts by stakeholders in the execution of business practices, and in the food service sector represents potential benefits [11].

In the case of the restaurant sector, SOI must prioritize services, considering the growing competition [15], since strategies that involve service innovation and relate it to sustainability allow differentiation in the environment in which it is developed, in addition to contributing substantially to the SDGs [46].

Sustainability-oriented service innovation, known as SOSI, is a practice that focuses on innovation and the sustainability of the service offered, which allows companies to promote their environmental awareness and achieve long-term sustainability in the economic, social, and environmental contexts, thereby contributing to the SDGs [47]. SOSI has become a model that allows service companies to measure their innovative progress and develop strategies to make business practices increasingly sustainable, through an organic process led by people for people [48].

Nowadays, companies face great environmental and socio-economic challenges, driving innovation as a relevant factor [44] and focusing on sustainability-oriented service innovation [49]. This type of innovation occurs in response to the new commercial logic in companies that face social and environmental challenges [44]. However, research focused on this topic is scarce, presenting mostly information on innovation at a general level, which makes SOSI an emerging field of research.

SOSI depends on several factors for its implementation, such as: design of new sustainable proposals, development of sustainable interactions with new customer niches, novel approaches to technological and organizational systems, and new administrative and accounting capabilities to measure environmental, social, and economic impacts [50].

In the specific area of marketing, SOSI plays a significant role in relation to other associated variables from the consumer perspective, such as brand equity, since its implementation conditions the behavior of customers in relation to the service offered [1]. As has been evidenced, the literature lacks sufficient studies on SOSI, even more so in the restaurant sector in Latin American countries, allowing us to conclude that this study is the first to be carried out in this region, with the objective of classifying restaurants using SOSI as one of the central variables.

1.4. Brand Equity

From the consumer's perspective, brand equity is defined as "the differential effect that brand knowledge has on consumer response to the marketing of that brand" [51] (p. 8). According to Aaker, the sources of brand equity are brand awareness, brand image, perceived quality, and brand loyalty [52].

Brand equity exists when it generates value for the customer through strong, favorable, and unique associations, which also creates value for the company [53]. On the one hand, companies use brand equity to create market value and capture profits while, on the other hand, consumers use this intangible factor as psychic income and benefits for their lifestyle [54]. The strength of a brand is related to greater customer loyalty, greater resistance to crisis situations, and more favorable customer responses to price changes [55,56]. Thus, stronger brands generate greater income, as seen in various industries [1], including the hospitality sector [56].

For the latter, it has been pointed out that the components with the greatest relevance in determining brand equity are brand loyalty, perceived quality, brand image [56], and brand awareness [57]. These are cognitive and affective factors that the customer associates with the brand, driving them towards their purchase intention [56].

To measure brand equity, instruments are proposed that consider variables related to perceptions (attributes, benefits, and attitudes). However, some works have used a

measurement of global brand equity or brand equity index, in particular the scale proposed by Yoo et al. [58], which has been validated by studies in the field of tourism, e.g., [59–61].

Brand equity is an intangible element of companies and considered a source of increasing and sustainable profitability over time [59]. In addition, it provides value to consumers and other stakeholders, which is why building brand equity is a top priority for companies [53,56].

The creation of brand equity and its relationship with ecological sustainability differs depending on restaurant type [62] as sustainable innovation is a pre-requisite for greater equity [17,53,54]. Sustainable innovation represents an effective way for companies to use environmental challenges as opportunities that generate competitive advantages, reduce costs, and position themselves in the minds of consumers [63].

In addition to sustainable innovation, there are other factors that contribute to brand creation, such as green supply chain management [64] and green employee training [17,59,65], particularly the latter due to its direct impact on the quality perceived by customers, in addition to the trust and loyalty it generates in them [65].

Considering the theoretical evidence presented in the research, it is determined that there are research questions that the literature has yet to address, such as:

RQ.1: Are employee training indicators on sustainability and food waste management at various service stages and product categories useful for identifying different groups of restaurants?

RQ.2: Are there differences in implemented sustainable practices and brand equity between restaurant groups defined based on employee sustainability and food waste management training?

2. Materials and Methods

2.1. Questionnaire and Data Collection

This work uses quantitative analysis methods. For data collection, a survey was conducted with an ad hoc structured questionnaire. The variables evaluated are food waste by service phase and product category [66] (12 indicators), employee training in environmental management [67] (2 indicators), sustainability-oriented service innovation [68] (5 indicators), and brand equity [69] (4 indicators), which are presented in Appendix A. The following percentage scale was used for the items related to food waste estimated by the restaurant manager: 1 = less than 5%, 2 = between 6 and 10%, 3 = between 11 and 15%, 4 = between 16 and 20%, 5 = more than 20% of the product category. Employee training in environmental management and sustainable practices is measured on a 5-point Likert scale, where 1 is "not at all implemented" and 5 is "fully implemented". Brand equity is also measured on a 5-point Likert scale, with 1 being "strongly disagree" and 5 being "strongly agree".

The fieldwork was carried out through a personal interview with the managers, directors, owners, and/or supervisors of 300 independent restaurants in the three coastal cities with the greatest tourist influx in Ecuador, such as Guayaquil, Manta, and Portoviejo, whose information was obtained from the database of the Internal Revenue Service (SRI) and TripAdvisor.

2.2. Statistical Analysis

Before applying the segmentation procedure, we assess the reliability of the scales used to measure staff training, sustainability-oriented service innovation, and brand equity. The values for the Cronbach alpha coefficients are 0.880, 0.861, and 0.932, respectively, being, therefore, adequate as they are higher than 0.8. From the data collected, restaurant groups were identified using the multivariate technique of Cluster Analysis, which allows the grouping of items according to their own characteristics, determining a specific criterion that explains the generation of resulting clusters. This criterion is based on the distance or proximity between the cases studied [70].

In this case, the cluster analysis considers food waste and staff training in sustainability as classification variables, considering brand equity and other environmentally sustainable

practices to check for differences between the groups. After verifying the normality of the distribution of the items measuring food waste and staff training in sustainability through their asymmetry and kurtosis coefficients, the hierarchical method of cluster analysis was applied to obtain the ideal number of clusters, based on the indicators of staff training and food waste according to their service phase and product category. Subsequently, the K-means non-hierarchical method was selected, attributing to it the number of clusters resulting from the previous method, considered the most appropriate according to the respective calculations.

Additionally, to validate the results, a discriminant analysis was carried out. This analysis is a statistical test of verification and explanation of the variables that belong to each group according to their discriminant power [71].

3. Results

To identify restaurant groups according to the level of training provided in green practices and food waste management, the hierarchical method is first used to delimit the number of clusters. In this case, the optimal number of clusters is two. Next, since no cluster is expected to be included in another, a K-means non-hierarchical clustering method is selected [72]. This method requires several clusters and the initial centroids, provided by the hierarchical analysis performed above.

Table 1 presents the means of the cluster descriptors and the significant differences between groups for the indicators included in the cluster analysis, i.e., those related to employee training and food waste. As seen from the values collected in the table, two clusters are identified: (1) restaurants with low employee training and high food waste; and (2) restaurants with medium employee training and low food waste.

Table 1. Mean values and t test for difference in means for cluster variables.

Variables	1 N = 162	2 N = 138	t
Employee Training	1.57	2.99	−9.36 *
Food Waste by Service Phase			
Food storage waste (% food stored in pantry that is discarded over total food in pantry)	4.08	2.10	12.99 *
Dish prep waste (% food that is discarded over total of food being prepared)	4.39	1.62	21.40
Dish waste served over total prepared dishes (percentage of leftovers left by guests over total dishes served to guests)	3.95	1.38	18.72 *
Waste in dishes prepared as a sample on the total of dishes prepared (percentage represented by the sample dishes—which are not consumed by customers—on the total of dishes prepared)	2.6	1.33	8.25 *
Food waste by product categories			
Dairy, ice cream, and sherbets	4.15	1.94	13.71
Fat, oil and, oil-based products	4.50	2.14	18.77
Fruits and vegetables	3.93	1.62	18.11 *
Pastries and candies	2.87	1.82	7.22 *
Cereal and bakery products	3.40	2.33	6.23 *
Meat and meat products	3.82	1.72	14.00 *
Fish and seafood	3.49	1.82	10.52 *
Eggs and egg products	4.31	2.26	13.83 *
Ingredients, spices, and dry products	4.06	1.61	16.42 *
Non-alcoholic beverages, excluding dairy products	3.31	1.34	13.57 *
Alcoholic beverages	3.66	1.82	14.47 *
Food prepared and mixed to serve to the guest	4.02	1.67	14.38 *

* Significant differences between clusters, $p < 0.05$.

On the one hand, cluster 1 has a higher concentration of restaurants, 162 out of 300, with a low level of employee training, with an average of 1.57; while the level of food waste both by service phase and by product category is high, since the average value of all its indicators is higher than 2.5. Cluster 2 is made up of 138 restaurants, with a high

level of employee training in sustainable practices located around the midpoint of the scale (average of 2.99) and a low level of food waste (average less than 2.5).

However, no significant differences are observed between the restaurants included in the two identified clusters regarding waste in the preparation phase of dishes and food waste in the categories of dairy products, fats, and oil-based products.

In order to understand the behavior of other variables not included in the cluster analysis, such as SOSI and brand equity in the resulting groups, the data in Table 2 are presented, which shows that restaurants in cluster 1 (less employee training/greater food waste) consider themselves to be more innovative in sustainable services and, at the same time, that they enjoy greater brand equity. These results could be derived from a less critical assessment of the implications of sustainable innovation by the managers of the restaurants in this first group, considering the low level of training they have. They could also be unable to correctly perceive brand equity and score themselves highly, when the reality is a different matter.

Table 2. Mean values and t test for difference in means for SOSI and Brand Equity.

Variables	1 N = 162	2 N = 138	t
Sustainability-oriented service innovation			
"Green" food and material/sustainable sourcing policy	3.83	2.38	8.45 *
Energy Efficient Cooking Mode	4.69	3.64	8.79 *
Environmentally sustainable business management ('green' business processes)	3.72	2.88	4.86 *
"Green" equipment and environment (e.g., natural light, sustainable building. . .)	3.84	3.13	4.07 *
Restaurant recommends low carbon activities (e.g., guest ordering via smartphone or mobile phone)	4.12	2.49	9.90 *
Brand equity			
For our restaurant guests, it makes sense to come to our restaurant.	4.94	4.78	2.24 *
Our restaurant guests prefer to come to our restaurant, even if there are other restaurants with similar features.	4.96	4.49	6.09 *
Our restaurant guests prefer to come to our restaurant, even if there are other restaurants as good as ours.	4.93	4.49	5.34 *
For our restaurant guests, it is smart to come to our restaurant.	4.96	4.72	3.28 *

* Significant differences between clusters, $p < 0.05$.

On the other hand, the restaurants in cluster 2 (more employee training/less food waste), although they have lower average values than those in cluster one, still exceed the average of 2.5, which gives them the same score as group 1, except for innovation in sustainable supply policies and the restaurant's induction of the customer to carry out activities with low carbon emissions. This leads us to believe that the level of training of employees and the level of food waste are not grouping variables that distinguish restaurants with a higher or lower level of sustainable service innovation and brand equity within the competitive tourism context of Ecuador. However, this is contradictory, since restaurants with a greater investment in employee training and in innovating sustainable services are those with less waste and greater brand equity [17].

To understand what other green practices are related to the resulting restaurant clusters, the data in Table 3 are presented, which show that group 2 (restaurants with a higher level of training and less food waste) applies water and energy savings and social sustainability actions to a greater extent, with significant differences between clusters. Meanwhile, group 1 (restaurants with a higher level of training and less food waste) shows higher average values for the implementation of practices such as: cooking style, packaging, and recycling, whose differences are significant between clusters.

Table 3. Mean values and t test for difference in means for cluster characterization descriptors.

Variables	Cluster 1 N = 162	Cluster 2 N = 138	t
Purchasing and planning	3.9095	3.3345	10.65
Cooking style	4.5216	3.7681	8.20 *
Packaging	2.5957	1.8225	6.32 *
Kitchen environment	4.6127	4.6123	0.01

Table 3. *Cont.*

Variables	Cluster 1 N = 162	Cluster 2 N = 138	t
Room environment	3.8049	3.9449	−1.78 *
Recycling	3.9519	3.4464	7.03 *
Customer information	2.0074	2.0507	−0.38
Water and energy savings	2.0370	3.1739	−10.27 *
Social sustainability	1.0514	2.5217	−13.84 *

* Significant differences between clusters, $p < 0.05$.

Regarding the classification variables, according to the characterization criteria of the restaurants surveyed (See Table 4), the data show that only gender, age, and restaurant type present significant associations ($p < 0.10$) within these clusters. The results indicate that cluster 2 (restaurants with high employee training and low food waste) has a higher concentration of male managers over 46 years of age, who manage four- and five-star restaurants, unlike the female gender, which has a greater presence in cluster 1, managing lower-category restaurants, with an age range of mostly between 26 and 46 years old.

Table 4. Classification variables.

Classification Variables (%)	1	2	Chi^2	*p*-Value
Gender				
- Male	29.7	34.7	13.547	<0.0001
- Female	24.3	11.3		
Age				
- 18–25 years	6.3	2.0		
- 26–35 years	25.3	19.3		
- 36–45 years	16.3	14	12.773	0.012
- 46–55 years	3.7	8		
- 56 years and older	2.3	2.7		
Educational level				
- Primary education	1.7	1.3		
- Secondary education	27.3	21.3	0.586	0.746
- Higher education	25.0	23.3		
Position				
- Hotel Manager	1.0	0.7		
- Hotel owner	5.7	4.3		
- Restaurant Manager	11.7	12.3	3.878	0.423
- Restaurant Owner	4.0	5.7		
- Other	31.7	23.0		
Average menu price				
- Less than $5	6.0	2.3		
- $6 to $10	18.3	18.3		
- $11 to $15	12.0	10.7	4.044	0.400
- $16 to $20	7.3	6.3		
- More than $20	10.3	8.3		
Menu Type				
- À la carte single size	33.3	28.7		
- À la carte small or normal portion	17.7	15.3	0.230	0.891
- Buffet	3.0	2.0		
Restaurant Category				
- One fork	4.3	1.0		
- Two forks	25.7	19.3		
- Three forks	14.7	13.3	9.160	0.057
- Four forks	8.7	10.7		
- Five forks	0.7	1.7		

In confirmation of these findings, Table 5 presents the results of the Discriminant Analysis, which shows that the correctly classified cases are 158 in cluster one and 137 in cluster two, resulting in 98.33% effectiveness in the classification carried out.

Table 5. Contingency Table Group Predicted by Cluster Analysis X Group Predicted by Discriminant Analysis.

		Group Predicted by Discriminant Analysis		
		1	**2**	**Total**
Group predicted by Cluster analysis	1	158 52.7%	4 1.3%	162 54%
	2	1 0.3%	137 45.7%	138 46%
	Total	159 53%	141 47%	300 100%
Kappa Index: 0.9833				

Finally, Table 6 shows a summary of the main characteristics of the resulting clusters, specifying which variables and indicators of the variables studied are grouped according to the highest mean values, in relation to the other group of restaurants.

Table 6. Summary of clusters characteristics.

Cluster 1: **Restaurants with Low Staff Training and High Level of Food Waste**	**Cluster 2:** **Restaurants with High Staff Training and Low Level of Food Waste**
N = 162 (54%)	**N = 138 (46%)**
High level of Sustainability-Oriented Service Innovation (greater than cluster 2).	High level of innovation only in the following indicators: • Energy Efficient Cooking Mode • Environmentally sustainable business management ('green' business processes)
High brand equity (slightly higher than cluster 2)	High brand equity (slightly lower than cluster 1)
High level of implementation of the following green practices: • Packaging • Cooking style (slightly greater than cluster 2 • Recycling (slightly larger than cluster 2)	High level of implementation of the following green practices: • Water and energy savings • Social sustainability • Room environment (slightly larger than cluster 1)
Increased concentration of female administrators, with an age range of 26 to 46 years, who manage mostly 2- and 3-fork restaurants.	Increased concentration of male administrators, over 46 years old, who manage mostly 4- and 5-fork restaurants.

4. Discussion and Conclusions

Sustainability-oriented service innovation is a factor that tourism service companies have gradually incorporated to develop brand equity, generating value for the customer, and consequently contributing to the fulfillment of the SDGs, as indicated in several studies [1,47,54]. However, even though the interest of public, private, academic, and business entities has become widely known, there is still no evidence of studies that generate conclusive results on this variable and its relationship with other environmental sustainability factors in restaurants.

Considering that the creation of brand equity is one of the results of sustainability-oriented service innovation, it is important to point out that there are variations depending on the study context [17,62] and its related factors, such as food waste and the effect that employee training has on its effective management [59,65]. This is because food waste has become one of the biggest concerns worldwide, so its reduction has been incorporated into one of the SDGs with the highest priority for attention. In addition to threatening environmental sustainability, it also adversely affects the economic sustainability of companies, mainly restaurants, as these establishments are the main sources of waste. In this sense,

several studies [3,10,13] have agreed that employees play a vital role so their training must align with environmental demands.

Due to the relationship between sustainability-oriented service innovation and brand equity, as well as training in green practices in food waste, this research presents important results on the restaurant categories that group these variables, which may mean the beginning of a line of research on the different groups that are generated according to the study context.

In this way, the cluster analysis conducted in this study allowed for the identification of two groups of restaurants whose classification was confirmed through a discriminant analysis, allowing us to know the following characteristics of the resulting groups:

- Cluster 1: restaurants with less training in green practices, a higher level of food waste, in the 2- and 3-fork categories, and managed mostly by women aged between 26 and 46 years old; this group is also characterized by self-assessing as the most innovative in sustainable services and enjoying greater brand equity, in addition to demonstrating greater implementation of green practices in packaging, cooking styles, and recycling.
- Cluster 2: restaurants with more training in green practices, a lower level of food waste, concentrated mainly in the 4- and 5-fork categories, whose managers are mostly men over 46 years old; this group is also characterized by a greater implementation of green practices such as water and energy saving, social sustainability, and dining room environment.

This grouping is aligned with the results of other studies in different contexts that establish that the higher the level of staff training in environmental management, the lower the level of waste, and vice versa [3,5,10,13,17,19,20]. Specifically, it is concluded that, in line with other recent studies, e.g., [3,5,13], restaurants with more training in green practices generate less waste; however, contrary to the theories put forward in various investigations [17,59,65], these restaurants are not perceived as more innovative in sustainability-oriented service, nor do they believe that they enjoy greater brand equity. It is considered that these results should be discussed in other contexts, since the low training of personnel in environmental issues generates a lack of knowledge about the true implications of sustainable innovation, which is also related to the cultural environment of the Ecuadorian coasts [73]. As a limitation of the present study, the questionnaire does not include any questions regarding the frequency of the training of the restaurants or the method to evaluate the employee's training by the restaurant owner/manager. Further research should analyze the relevance of these factors on brand equity, as well as the effectiveness of the training materials on sustainable practices provided by the government to the restaurants.

This research also generates interesting results that become questions to be solved in future investigations, such as the role of women as managers of lower-category restaurants with less training in green practices, which are determining factors to achieve objectives both in environmental sustainability and in economic and social sustainability, building, therefore, an effective brand equity. One of the reasons why sustainable innovation is poorly conceived by restaurants on the Ecuadorian coast is related to the low level of employee training, given the cultural environment in which they operate [73]. Along these lines, the execution of training projects that involve establishments in the tourism sector is particularly important, from a critical position in accordance with environmental demands, with the aim that those responsible act with critical and innovative thinking at any time and place [74].

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Appendix A Variables, Indicators, and Sources

Staff Training [67]
Environmental management policies or practices are published or otherwise made known to the employee.
Training programs are carried out annually to improve the employee's environmental management skills.
Food Waste by Service Phase [66]
Food storage waste (% food stored in pantry that is discarded over total food in pantry)
Dish preparation waste (% food that is discarded over total food that is prepared)
Dish waste served over total prepared dishes (percentage of leftovers left by guests over total dishes served to guests)
Waste in dishes prepared as a sample (of exposure) on the total of dishes prepared (percentage represented by the sample dishes—which are not consumed by customers—on the total of dishes prepared)
Food waste by product categories [66]
Dairy, Ice Cream and Sherbets
Fat, oil, and oil-based products
Fruits and vegetables
Pastries and candy
Cereal and bakery products
Meat and meat products
Fish and seafood
Eggs and egg products
Ingredients, spices, and dry products
Non-alcoholic beverages, excluding dairy products
Alcoholic beverages
Food prepared and mixed to serve to the guest
Sustainability-oriented service innovation [68]
"Green" food and material/sustainable sourcing policy
Energy efficient cooking mode
Environmentally sustainable business management ('green' business processes)
"Green" equipment and environment (e.g., natural light, sustainable building. . .)
Restaurant recommends low carbon activities (e.g., guest ordering via Smartphone)
Brand equity [69]
For our restaurant guests, it makes sense to come to our restaurant.
Our restaurant guests prefer to come to our restaurant, even if there are other restaurants with similar features.
Our restaurant guests prefer to come to our restaurant, even if there are other restaurants as good as ours.
For our restaurant guests, it's smart to come to our restaurant.

Source: Compilation of authors.

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