






Article

# Green Restaurants ASSESSment (GRASS): A Tool for Evaluation and Classification of Restaurants Considering Sustainability Indicators

Dayanne da Costa Maynard <sup>1,\*</sup> , Renata Puppim Zandonadi <sup>1</sup> , Eduardo Yoshio Nakano <sup>2</sup> , António Raposo <sup>3,\*</sup>  and Raquel Braz Assunção Botelho <sup>1</sup> 

<sup>1</sup> Department of Nutrition, Faculty of Health Sciences, Campus Universitário Darcy Ribeiro, University of Brasília, Brasília 70910-900, DF, Brazil; renatapz@unb.br (R.P.Z.); raquelbotelho@unb.br (R.B.A.B.)

<sup>2</sup> Department of Statistics, University of Brasília, Brasília 70910-900, DF, Brazil; eynakano@gmail.com

<sup>3</sup> CBIOS (Research Center for Biosciences and Health Technologies), Universidade Lusófona de Humanidades e Tecnologias, Campo Grande 376, 1749-024 Lisboa, Portugal

\* Correspondence: day\_nut@yahoo.com.br (D.d.C.M.); antonio.raposo@ulusofona.pt (A.R.)

**Abstract:** Green restaurants are based on the implementation of environmental management and are closely related to quality management through a set of instruments and programs. This study aimed to build an instrument classification adopting cutoff points and classify restaurants using traffic light scores from the sustainability assessment checklist validated in Brazilian Portuguese for restaurants. The questionnaire classification validation was performed using a cross-sectional study conducted in a convenience sample of 97 restaurants. The instrument has 76 items, and all items were based on yes/no/not applicable answers, comparing sustainability activities. The instrument score was obtained by assigning one point to each “yes” item. Each section received a score, and a total score was provided to the restaurant from the three sections’ sum. International instruments used in the checklist development stage were checked to assist in the cutoff points determination. Therefore, the score for restaurants with low adherence to sustainable practices or red seal ranges from 0 to 40%, restaurants with medium adherence to sustainable practices or yellow seal from 40% > to <75%, and restaurants with good adherence to sustainable practices or green seal  $\geq 75\%$ . The instrument is divided into three sections (1. water, energy, and gas supply; 2. menu and food waste; 3. waste reduction, construction materials, chemicals, employees, and social sustainability). Percentages must be reached in all sections. Researchers did not find any green or sustainable restaurants through the checklist application in the tested sample, and 47.4% of the restaurants had the yellow seal (presenting sustainable activities) with higher scores for Section 2 regarding menu and food waste. The items less scored were the company has goals for the rational use of water, the company achieves zero greenhouse gas emissions with proven partnerships, the company has a documented program to reduce carbon emissions, and towels or uniforms are made of organic or sustainable material. Thus, it demonstrates the attention points and improvements in the analyzed restaurants. We hope that the construction and validation of the checklist and its score’s determination have contributed to broadening the discussions on sustainability in food services and serve as a starting point for future research. Strategies like these are fundamental to improve the understanding of the subject and to expand the knowledge of nutritionists who deal directly with this economic sector.

**Keywords:** sustainability; checklist; food services; sustainable development; assessment



**Citation:** Maynard, D.d.C.; Zandonadi, R.P.; Nakano, E.Y.; Raposo, A.; Botelho, R.B.A. Green Restaurants ASSESSment (GRASS): A Tool for Evaluation and Classification of Restaurants Considering Sustainability Indicators. *Sustainability* **2021**, *13*, 10928. <https://doi.org/10.3390/su131910928>

Academic Editor: Flavio Boccia

Received: 26 August 2021

Accepted: 26 September 2021

Published: 30 September 2021

**Publisher’s Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

The high demand for away-from-home meals and the increase in the number of restaurants has increased the production of meals, with large waste generation and use of various natural resources significantly impacting the environment [1–3]. The meals’

production must be in the context of social responsibility and sustainability, not just concerning the quality of the offered food [1,4,5]. Food services are considered the least sustainable among the world's economic sectors [6].

Given the global panorama of rising economic growth, high environmental demand, and the possible scarcity of natural resources, more sustainable meal production procedures have aroused the interest and awareness of professionals involved in food services. In addition, severe environmental problems, such as global warming, waste, and pollution, have also increased people's awareness of environmental issues and the value of activities based on sustainability [7].

Likewise, consumer awareness has expanded, and green consumption modes that include environmental awareness in purchasing behavior are becoming increasingly popular [8]. Researchers have pointed out that green restaurants have been increasing [9,10], and consumers are increasingly willing to spend more money on green restaurants [11]. Green restaurants are based on environmental management, improving service quality and products [12], generating more significant social, environmental, and economic impacts with reduced environmental damage [13].

However, to classify a restaurant as a green restaurant, it is necessary to check if its activities are aligned with the sustainability dimensions. Therefore, sustainability assessment tools are essential to evaluate what kind of sustainable practices restaurants adopt and understand the activities that can be implemented to become green restaurants. Sustainability assessment tools can be powerful not only to evaluate the restaurant but also to modify restaurant behavior. Thus, worldwide, studies evaluate sustainable activities through interviews guided by sustainability assessment tools [14,15]. Additionally, the literature demonstrates that establishing scores on instruments makes it possible to quantitatively estimate the outcome, interpreting the results more easily and transparently [16,17]. In Brazil, Maynard et al. [18] developed and validated an instrument to assess sustainability indicators for restaurants based on various international instruments that deal with the Environmental Management System, such as ISO 14000, ISO 14001, and ISO 14004 [19,20], and questionnaires that assess different activities in food services aiming at sustainability, such as the Sustainable Restaurant Association [21], the Green Seal [22,23], and the Green Restaurants Association [22]. This checklist [18] may represent a scientifically based alternative to assist in implementing sustainable activities in food services in Portuguese-speaking countries and subsidizing the definitions and actions that encompass sustainable restaurants. It is noteworthy that there is no other instrument in the Portuguese language validated for sustainable practices to date. The evaluation of the restaurants and the need for improvements can be an opportunity for the restaurants to have a competitive advantage and profitability, as well as helping strategies to reduce the sector's impact on the environment.

Given the lack of studies on sustainability indicators in restaurants, this study aimed to build an instrument classification adopting cutoff points and classify restaurants using traffic light scores from the sustainability assessment checklist validated in Brazilian Portuguese for restaurants.

## 2. Materials and Methods

This study is cross-sectional and carried out in Brazil from February 2020 to April 2021 in a sample of 97 restaurants, including institutional, community, commercial, hospital, and school restaurants, among others, selected for convenience, in different neighborhoods of the Federal District. The inclusion criteria were to have a nutritionist as the technical responsible and agree to participate in the survey. The inclusion of food services with a nutritionist facilitated data gathering. It was also justified by the need to apply the instrument with a qualified professional and technical knowledge of the evaluated indicators. The Ethics Committee of the University of Brasília approved this study's ethical and methodological aspects (no. 3.127.485). This study was performed in three phases

(phase 1—application of the sustainability assessment instrument in restaurants; phase 2—developing the checklist score; phase 3—data analysis).

### *2.1. Phase 1—Application of the Sustainability Assessment Instrument*

Researchers chose the checklist developed by Maynard et al. [18] in Portuguese to evaluate sustainable practices in restaurants. This evaluation method was chosen due to its low cost, high applicability, and accessibility, and the validated instrument was developed to the reality of the Brazilian restaurants. The instrument must be applied by a trained evaluator. Checklist items need to be checked with the nutritionists and/or employees of food services on days of the food services' routine.

The instrument has 76 items, divided into three sections (Section 1: water, energy, and gas supply; Section 2: menu and food waste; and Section 3: waste reduction, construction materials, chemicals, employees, and social sustainability).

The assessment instrument was applied in 97 restaurants by trained researchers. Each restaurant was evaluated during one day of meal production (while the food handlers performed their routine activities). The food handlers did not know the visit date previously. The visit was scheduled a week in advance with the nutritionist. All items were based on yes/no/not applicable answers, comparing sustainability activities [18].

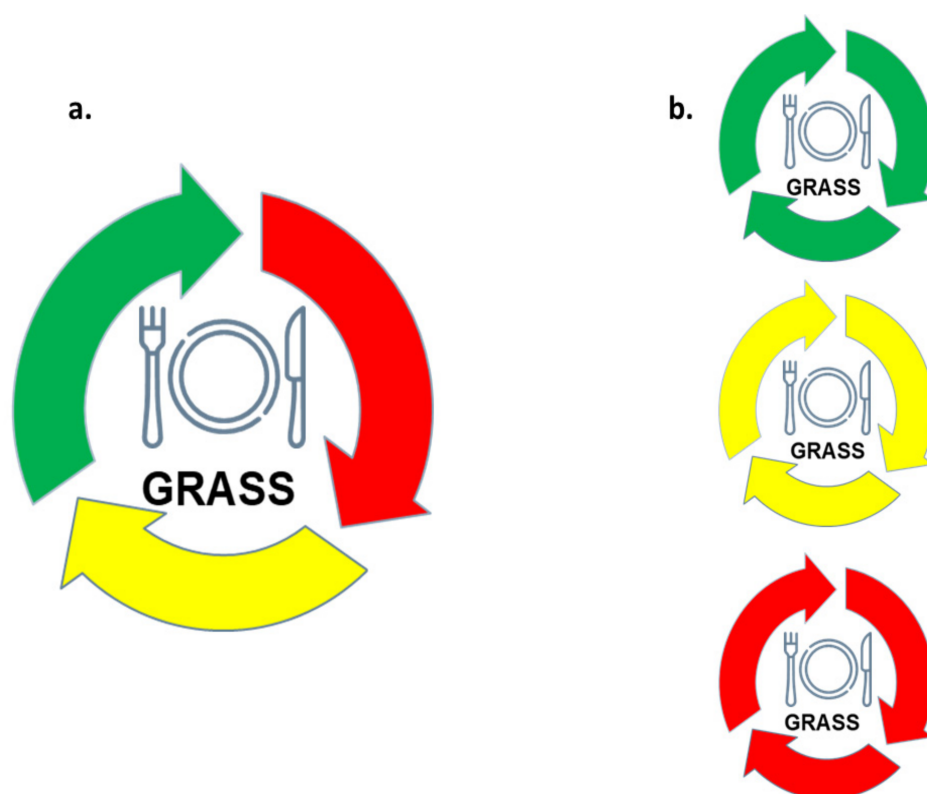
It is important to emphasize that the answer “not applicable” was later translated to “yes” or “no”, depending on its context, for the correct interpretation of the data (Supplementary file—Table S1).

### *2.2. Phase 2—Development of the Checklist Score*

The development of the score aims to provide an objective measurement to identify whether restaurants have sustainable measures. The checklist data from the 97 Brazilian restaurants were used to establish a classification score of restaurants with good adherence to sustainable practices. The instrument score was obtained by assigning one point to each “yes” observed item. The score was obtained by section and also for the complete instrument. Values from the three sections were summed to reach percentages between 0 and 100% for the complete instrument. Therefore, the score for restaurants with low adherence to sustainable practices ranges from 0 to 40%, restaurants with average adherence to sustainable practices from >40% to <75%, and restaurants with good adherence to sustainable practices  $\geq 75\%$  of affirmative answers. The higher the checklist score, the more sustainable the restaurant is. The score was converted in traffic-light color to facilitate the classification interpretation. In this sense, restaurants with good adherence to sustainable practices received the green color and were classified as green restaurants. Restaurants with average adherence to sustainable practices received the yellow color, and restaurants with low adherence to sustainable practices received the red color.

The international instruments used in the checklist construction stage [18] were checked to assist in the cutoff points adopted in this score construction process. The objective of this instrument was to evaluate the sustainability activities in restaurants that covered the three pillars of sustainability. For the restaurant to receive the sustainable designation, it needed to score in the three checklist's sections, following the same criteria for the overall assessment of the instrument.

The authors created a name for the instrument with the acronym Green Restaurant Assessment (GRASS) to add value and disseminate. Thus, a visual brand of the instrument and each classification was also created to be explored and disseminated in the visited establishments (Figure 1).



**Figure 1.** Visual mark of the instrument (a) and each classification adopted (b) Restaurants with good adherence to sustainable practices (sustainable green seal); medium adherence to sustainable practices (sustainable yellow seal); and low adherence to sustainable practices (sustainable red seal).

### 2.3. Phase 3—Data Analysis

Descriptive statistics are presented as mean, standard deviation, median, and interquartile range for quantitative variables and frequencies and percentages for categorical variables. The instrument's internal consistency and sections were assessed using Cronbach's alpha coefficient ( $\alpha$ ), at which values between  $0.6 \leq \alpha < 0.7$  are considered acceptable,  $0.7 \leq \alpha < 0.9$ , good, and  $0.9 \geq \alpha$ , excellent. All statistical analyses were performed using IBM SPSS version 22.0 software (SPSS Inc., Chicago, IL, USA).

### 3. Results

For this research, 97 Brazilian restaurants of different modalities were included in the sample. The hotel restaurant modality was invited to participate, but there was no positive response for inclusion in the sample. The restaurants' classification considered the division of the checklist into three sections, with a score generated within each section and a final score of the whole checklist. The aim was to ensure that the restaurant received an assessment of good adherence to sustainable practices if its score exceeded 75% in the three sections of the checklist. Even with a total score above 75%, the restaurant will not be classified as green if it does not reach above 75% in each section.

Table 1 shows the checklist's internal consistency in terms of completeness and per section, the average score per assessed section, the total, minimum and maximum scores for each section, and the average and median. The instrument as a whole showed good internal consistency ( $\alpha = 0.872$ ). All three sections also had good consistencies ( $\alpha > 0.6$ ). The minimum checklist score in the sample of 97 restaurants was 16%, and the maximum was 81.3%, considering the total score with a mean of 44.5 (SD = 12.5) (Table 1).

**Table 1.** Average score, IQR, minimum and maximum values, and Cronbach's alpha of the evaluation of the restaurants through the sustainability activities checklist (n = 97).

	N. Items	Min–Máx	Mean (SD)	Median (IQR)	Internal Consistency Alpha Cronbach
Section 1	27	22.2–66.7	39.7 (10.9)	37.0 (31.5–48.1)	0.604
Section 2	22	9.1–95.45	53.6 (18.1)	54.5 (45.5–63.3)	0.812
Section 3	26	3.8–88.5	41.9 (17.2)	42.3 (30.8–53.8)	0.774
TOTAL	75	16.0–81.3	44.5 (12.5)	44.0 (36.0–53.3)	0.872

IQR—interquartile range (Q1; Q3).

Table 2 shows the ranking of restaurants according to the checklist score. None of the restaurants achieved the minimum score of 75% in Section 1, which involved water, energy, and gas supply activities. Therefore, none were considered with good adherence to sustainable practices (green seal), but according to the classification, 47.4% (n = 46) of them had average adherence to sustainable practices (yellow seal). Concerning Section 2, which involves menu activities and food waste, the restaurants obtained higher scores, demonstrating that they carried out most sustainability activities.

**Table 2.** Percentage classification of the overall score and the sections of the evaluated restaurants (n = 97).

	Not Sustainable (Score $\leq$ 40%)	Carries Out Sustainable Activities (40% < Score < 75%)	Sustainable (Score $\geq$ 75%)
Section 1	51 (52.6%)	46 (47.4%)	0 (0%)
Section 2	17 (17.5%)	74 (76.3%)	6 (6.2%)
Section 3	48 (49.5%)	46 (47.4%)	3 (3.1%)
TOTAL	51 (52.5%)	46 (47.4%)	0 (0%)

The frequency of responses observed for the 97 restaurants is presented in Table 3. Items that address immediate repair of the plumbing in the event of a leak (96.9%), check if faucets are open (90.7%), properly capped and clean water reservoir (99%), training of employees to avoid waste (89.7%), recycling cooking oil (90.7%), company furniture with durable materials (90.7%), and using diluted cleaning products (82.5%) were the most reported in this study.

On the other hand, the least reported items in Section 1 were as follows: the company has goals for the rational use of water (5.2%); the company achieves zero greenhouse gas emissions with proven partnerships (9.3%); the company has a documented program to reduce carbon emissions (4.1%); the company has documented goals to reduce the use of liquefied petroleum gas (4.1%); and the company uses biogas (1.0%). In Section 2, the items were as follows: at least 50% of the company's fruits and vegetables have organic certification (7.2%); the company uses animal products with organic certification (12.4%); and the company purchases animal products with animal welfare certification (12.4%). Finally, in Section 3, the least reported were as follows: towels or uniforms are made of organic or sustainable material (9.3%); the company uses recycled paper (12.4%); and the company purchases one or more products from a charitable foundation or social impact company (12.4%). Thus, it demonstrates the points of attention and needs for improvement in the analyzed restaurants.

It is essential to report that after applying the checklist in restaurants, item 1.17 (regarding air conditioning use) was withdrawn for providing a similar response to item 1.21, not compromising the validation of the instrument.

**Table 3.** Frequency and percentage of performed items per checklist section among the evaluated food services (n = 97).

Item		%
<b>Section 1</b>		
Q1.1 The company has goals for the rational use of water, such as the use limit per activity (for example: for each meal served, 10 L of water are spent).	5	5.2%
Q1.2 The company has reduced at least 15% in the last six months, or in the previous 12 months, 30% of water consumption, being monitored by the record (see history of water bills).	17	17.5%
Q1.3 The company performs preventive maintenance of the plumbing.	42	43.3%
Q1.4 The company, in case of a water leak, performs immediate repair.	94	96.9%
Q1.5 Employees verify that taps, when not in use and at the end of the service, are closed (Note: confirm with the employee).	88	90.7%
Q1.6 The pressure of kitchen faucets, washbasins, and bathrooms is regulated and limited to allow water savings.	43	44.3%
Q1.7 Taps installed in hand or kitchen sinks have automatic activation.	54	55.7%
Q1.8 The water reservoir is or is adequately kept covered and conserved that is free from cracks, leaks, infiltrations, peeling, and other defects.	96	99.0%
Q1.9 The company does not use running water to melt ice in sinks or thaw food.	67	69.1%
Q1.10 Employees remove dirt without water from utensils before putting them in the washing machine.	50	51.5%
Q1.11 Dishwashers are operated only at full loading capacity.	46	47.4%
Q1.12 When cleaning floors, the water flow is interrupted when it is not necessary to use it.	72	74.2%
Q1.13 Rainwater is collected, and/or water from thermal counters that use water is recycled for use in activities where the use of drinking water is not required (e.g., flushing, washing outside areas).	17	17.5%
Q1.14 The company has documentation for the assessment and/or inspection of energy use for energy conservation.	11	11.3%
Q1.15 The company has reduced at least 15% in the last six months or 30% in the previous 12 months (see history of energy expenditure).	22	22.7%
Q1.16 The company has smart energy meters. Check the energy meter.	19	19.6%
Q1.17 The refrigerator and freezer doors have audible alarms for open doors or automatic locks.	14	14.4%
Q1.18 The temperature of refrigerators, cooling chambers, and freezers are adequate and have a monitoring record.	91	93.8%
Q1.19 The company performs and documents the maintenance recommended by the manufacturer for electronic devices to ensure that all equipment is functioning correctly and maintains energy efficiency levels.	43	44.3%
Q1.20 The company cleans the air cooler filters with suitable detergents or contracts a third-party company for this service and changes the replaceable filters according to the manufacturer's guidelines.	87	89.7%
Q1.21 The company has lighting controls, such as sensors and timers, in low-occupancy areas (for example, in the distribution area) so that lights are automatically turned off when daylight is sufficient or when spaces are not being occupied.	24	24.7%
Q1.22 The company uses some form of renewable energy (wind, solar, or photovoltaic) in the production area.	12	12.4%
Q1.23 The company achieves zero greenhouse gas emissions with proven partnerships (e.g., commercial energy and vehicle fuel use).	9	9.3%
Q1.24 The company has a documented program to reduce carbon emissions (by at least 5% per year).	4	4.1%
Q1.25 The company has documented targets for reducing the use of liquefied petroleum gas.	4	4.1%
Q1.26 The company has documented targets for reducing the use of natural gas.	8	8.2%
Q1.27 The company uses biogas.	1	1.0%

Table 3. Cont.

Item		%
<b>Section 2</b>		
Q2.1 The company owns and uses the technical preparation sheets to make the preparations.	71	73.2%
Q2.2 The company has options for smaller portions separately or a children's menu.	79	81.4%
Q2.3 The company offers $\geq 50\%$ of its proven healthiest preparations.	81	83.5%
Q2.4 The company offers a separate menu or substitutions to meet diet restrictions, such as gluten-free preparations, vegetarian cuisine, vegan menu, or preparations to meet religious restrictions.	83	85.6%
Q2.5 The company has documented commitments, with a defined term, to reduce the use of sugar, salt, or saturated fat on the menu.	58	59.8%
Q2.6 The company includes seasonal products in its menu, changing them throughout the months of the year.	79	81.4%
Q2.7 At least 50% of the fruits and vegetables that the company buys are certified organic.	7	7.2%
Q2.8 The company manages its vegetable garden without using pesticides.	20	20.6%
Q2.9 Suppliers of products of animal origin have certificates that prove that animals are raised without the application of antibiotics or organics.	12	12.4%
Q2.10 The company only purchases products of animal origin that have an animal welfare certification seal.	12	12.4%
Q2.11 The company has a policy of purchasing sustainable seafood.	24	24.7%
Q2.12 The company's supplier produces farmed fish and has a sustainability certification (for example, organic).	12	12.4%
Q2.13 The company does not use ingredients or products with transgenic ingredients in its composition in the production of meals.	27	27.8%
Q2.14 The company prioritizes the full use of food, producing safe preparations that use peels, stalks, and/or edible shavings of vegetables and fruits as ingredients.	67	69.1%
Q2.15 The company assesses your food waste during food preparation.	65	67.0%
Q2.16 The company assesses its food waste during food distribution.	69	71.1%
Q2.17 The company discards food waste in the form of composting, anaerobic digestion, and maceration, donates to feed pigs, or establishes partnerships with cooperatives that carry out these processes.	63	64.9%
Q2.18 The company trains its employees to avoid food waste during all stages of meal production, from the receipt of food to distribution.	80	82.5%
Q2.19 The company carries out smart ordering systems, inventory monitoring, inventory rotation, and/or other inventory management strategies to avoid food waste.	87	89.7%
Q2.20 The company has goals for reducing/controlling food waste.	40	41.2%
Q2.21 The company recycles or reuses its coffee grounds.	19	19.6%
Q2.22 The company recycles cooking oil and/or transfers the cooking oil used to recycling companies.	88	90.7%
<b>Section 3</b>		
Q3.1 The company has an operational policy that contains a documented strategy on solid (non-food) waste management.	56	57.7%
Q3.2 The company separates recyclable materials, that is, selective collection.	64	66.0%
Q3.3 The company limits packaging and orders products in bulk to avoid waste generation.	38	39.2%
Q3.4 The company does not use disposables and/or adopts strategies to minimize the use of these materials as much as possible, with documented goals.	52	53.6%
Q3.5 The company adopts strategies to reduce the use of plastic in the distribution of meals.	58	59.8%
Q3.6 The company returns packaging boxes for suppliers to reuse and/or provides suppliers with their returnable boxes for the delivery of goods.	55	56.7%
Q3.7 The company returns glass bottles for suppliers to reuse and/or properly disposes of these materials for recycling.	38	39.2%



Table 3. *Cont.*

Item		%
Q3.8 The company adopts measures to encourage its customers to reduce waste (for example, maintaining glasses, reducing disposable packaging, and eliminating plastics or straws, among others).	53	54.6%
Q3.9 The company uses recycled paper or FSC-certified office paper.	12	12.4%
Q3.10 The company uses lamps, accessories, or furniture made from recovered or recycled materials or those provided with an Environmental Product Declaration to improve the environmental impact.	24	24.7%
Q3.11 The paints used for building are environmentally sustainable.	26	26.8%
Q3.12 The furniture (tables, chairs, and others) of the company are made of durable materials that can be repaired.	88	90.7%
Q3.13 The tablecloths (if any) and/or employees' uniforms are made of organic or environmentally sustainable materials.	9	9.3%
Q3.14 The company uses rechargeable batteries for battery-powered devices and equipment, including flashlights, handheld vacuum cleaners, and others.	28	28.9%
Q3.15 Office equipment replaced or purchased is ENERGY STAR or PROCEL certified.	48	49.5%
Q3.16 The company uses only ecological cleaning products.	21	21.6%
Q3.17 The company uses cleaning concentrates and dilution control systems and/or employee training and monitoring for adequate dilution to minimize the use of chemicals.	80	82.5%
Q3.18 The company exclusively uses environmentally sustainable hand cleaners in the bathrooms of customers and employees.	17	17.5%
Q3.19 The team has already undergone environmental training (energy efficiency and water efficiency).	31	32.0%
Q3.20 The team has already undergone environmental training (fundamentals of sustainability).	25	25.8%
Q3.21 The staff has undergone some training on healthy eating and the health impact of what they are producing.	75	77.3%
Q3.22 The company has a strategy regarding donations or support to its community.	43	44.3%
Q3.23 The company donates to food banks or charities to avoid wasting food from products suitable for consumption.	19	19.6%
Q3.24 The company has initiatives to promote healthy eating education for the local community (schools, colleges, and community groups).	41	42.3%
Q3.25 The company has a policy with the supplier or purchase specification in place that favors the acquisition of local products for foods such as dairy products, meat, fruits, and vegetables.	43	44.3%
Q3.26 Does the company purchase one or more products from a charitable foundation or a social enterprise that provides social impact? (For example, products made from leftover food, bread from a social enterprise bakery, etc.)	12	12.4%

#### 4. Discussion

This study allowed us to develop the first validated tool for evaluating and classifying restaurants considering sustainability indicators in Brazil: Green Restaurants ASSESSment (GRASS). This tool is a straightforward way to classify (for owners) and identify (for clients) the restaurants with good adherence to sustainable practices (sustainable green seal), restaurants with medium adherence to sustainable practices (sustainable yellow seal), and restaurants with low adherence to sustainable practices (sustainable red seal).

The adoption of traffic lights intends to easily demonstrate the relationship between the number of sustainable activities and their colors, with red being an alert sign (places need to rethink their attitudes) and the color green for those places that already carry out many sustainable activities. This model is already used in the food sector through nutritional traffic lights on labels, which allow a better understanding of the labeling information and help to guide for healthier choices [24].

Our results showed that the lack of sustainable activities in the Brazilian Federal District's restaurants is a reality. None of the 97 restaurants were classified as restaurants



with good adherence to sustainable practices (green seal) within the three sections. If the instrument only considered the final score of 75% independently of the sections, 2.06% of the studied sample ( $n = 2$ ) would achieve a sustainable green seal classification. Thus, restaurants show low adherence to green production and consumption, even though consumers demand it [25–27]. Due to the lack of government incentives to include sustainable activities or the lack of requirements or laws on practices that mitigate environmental damage, restaurants showed low scores in this study.

The lack of sustainable procedures was also seen in Luduvic et al. [28] study that analyzed 14 food services in Brazil. They found that activities such as selective collection, technical preparation files, purchase of organic or agroecological products, and employee training on sustainability were not carried out. Furthermore, a study [29] that evaluated the opinion of health, agriculture, and environmental professionals ( $n = 298$ ) about sustainable practices in New Zealand showed that the majority (63%) reported that practices in the Food System are not sustainable. Although the consequences of unsustainable meal production activities such as increased food waste, excessive use of energy through non-renewable sources, carbon footprint accumulation, and excessive use of plastics are numerous [30,31], few studies propose practical strategies to assess the performance of these activities by food services.

In this study, activities such as the rational use of water, reduction of greenhouse gases, and the use of organic food were little reported, demonstrating the importance of evaluating restaurants. Similar and worrying data were presented in the study by Tomio and Schmidt [32] that evaluated actions carried out by 31 restaurants concerning water sustainability. The results showed few actions about this natural resource, except the concern with economical expenditure but without any initiative in favor of resource conservation. These data reinforce the need for restaurants to think about collective actions around water since this resource is essential for the operation of companies. Concerning greenhouse gases and the purchase of organic food, some studies report that diets rich in sugars, fats, oils, and meats are the ones that most contribute to the emission of greenhouse gases and deforestation, requiring a change in eating behaviors from restaurant menus to diners' food choices so that there are not only benefits to nature, such as reduced greenhouse gas emissions, reduced deforestation, and reduced species extinction, but also improvement of the population's health and valorization of organic food [33,34].

Studies reported ways that restaurants could reduce their environmental impacts without raising costs [30,35]. Examples are buying local products, managing water and energy efficiently, reducing food waste, using eco-friendly cleaning products, using paper packaging in place of plastics, and training employees on sustainability topics (full use of food, energy, and water efficiency, among others). It is important to note that these items were also evaluated in this study with low achievement percentages by the restaurants' sample, except for the item that seeks to know whether restaurants monitor stock to reduce food waste, which had a high achievement percentage (89.7%).

Another fundamental strategy for food services is using renewable energies that do not harm the environment, being a socio-environmental attraction, and reducing the company's costs. In Brazil, the government and banks have created incentives for companies to set up their solar plants, reducing fees and increasing time for financing [36]. In addition to the activities mentioned, food services need to carry out educational and awareness-raising activities for diners, reducing the purchase of multi-packaged food, using biodegradable chemicals, and cleaning products.

On the other hand, the items that address food waste, recycling of cooking oil, use of durable furniture, and use of diluted cleaning products were the most reported in this study, showing that they are actions carried out by companies. The awareness regarding waste seems to be improving, but the food sector still wastes a lot of the meals produced. In the study by Tomaszewska et al. [37], which created and analyzed a waste scale for the hotel sector, the authors reinforced that employees need to be more trained in food handling and that it is of paramount importance to make consumers aware of the negative

impact generated by food waste. It is important to note that the mandatory score in the three sections was based on our previous study [13], which, through a systematic review, reinforces the importance that for the restaurant to be sustainable, it needs to have activities that cover the three sustainability indicators.

The data from this study resulted from the construction of the score and application of the checklist to classify sustainable practices in food services. In addition, an easy-to-use and free tool is advantageous because it is more likely to be used due to its practicality. Likewise, the score interpretation is simple, which can further encourage its use by nutritionists and owners of food services.

It is important to point out that training food professionals and entrepreneurs and raising the awareness of diners to practice sustainability through the conscious and sustainable use of natural resources are valuable ways to achieve sustainability [25].

It is also noteworthy that the checklist application in food services aims to encourage them to carry out measures that were not thought of before. Restaurants face difficulties in implementing sustainable activities due to the lack of knowledge and fear of rising costs [6]. In this context, the checklist and the classification score represent a viable way to recognize the food service as environmentally friendly or green.

This study presented some limitations, as it was not applied in all types of restaurants. Additionally, due to the COVID-19 pandemic, the restaurants' closures diffculted the data collection in a higher number of restaurants.

## 5. Conclusions

This study first developed a validated tool for evaluating and classifying restaurants considering sustainability indicators in Brazil. The Green Restaurants ASSESSment (GRASS) tool is a straightforward way to classify and identify the restaurants with good adherence to sustainable practices (green seal), restaurants with medium adherence to sustainable practices (yellow seal), and restaurants with low adherence to sustainable practices (red seal). The traffic lights are used to demonstrate the sustainable activities carried out in restaurants using the colors. Our results showed the lack of sustainable activities in the Brazilian Federal District's restaurants, reinforcing the importance of covering the three sustainability indicators. We hope that the construction and validation of the checklist and its score's determination have contributed to broadening the discussions on sustainability in food services and serve as a starting point for future research. Strategies like these are fundamental to improve the understanding of the subject and to expand the knowledge of nutritionists who deal directly with this economic sector.

**Supplementary Materials:** The following are available online at <https://www.mdpi.com/article/10.3390/su131910928/s1>, Table S1: The final version of the checklist that assesses sustainability in food service and its classification scores.

**Author Contributions:** Conceptualization, D.d.C.M., R.B.A.B. and R.P.Z.; methodology, D.d.C.M., R.B.A.B., E.Y.N. and R.P.Z.; validation, D.d.C.M. and E.Y.N.; formal analysis, D.d.C.M., R.B.A.B., E.Y.N. and R.P.Z.; investigation, D.d.C.M.; resources, D.d.C.M. and A.R.; writing—original draft preparation, D.d.C.M., R.B.A.B., E.Y.N. and R.P.Z.; writing—review and editing, D.d.C.M., R.B.A.B., A.R. and R.P.Z.; visualization, D.d.C.M., R.B.A.B., A.R. and R.P.Z.; supervision, R.B.A.B. and R.P.Z.; project administration, R.B.A.B.; funding acquisition, D.d.C.M. and A.R. All authors have read and agreed to the published version of the manuscript.

**Funding:** This publication had as a source of funding the notice DPG/UnB n°0004/2021.

**Institutional Review Board Statement:** The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Ethics Committee of the University of Brasília (no. 3.127.485).

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The study did not report any data.

**Acknowledgments:** The authors would like to thank all nutritionists and establishment owners who cooperated with the data collection.

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

1. Lemaire, A.; Limbourg, S. How can food loss and waste management achieve sustainable development goals? *J. Clean. Prod.* **2019**, *234*, 1221–1234. [CrossRef]
2. Mourad, M. Recycling, recovering and preventing “food waste”: Competing solutions for food systems sustainability in the United States and France. *J. Clean. Prod.* **2016**, *126*, 461–477. [CrossRef]
3. Schanes, K.; Dobernig, K.; Gözet, B. Food waste matters—A systematic review of household food waste practices and their policy implications. *J. Clean. Prod.* **2018**, *182*, 978–991. [CrossRef]
4. Araújo, E.L.M.; Martins, A.C.; Carvalho, S. Sustentabilidade e geração de resíduos em uma unidade de alimentação e nutrição da cidade de Goiânia—GO. *DEMETRA Aliment. Nutr. Saúde* **2015**, *10*. [CrossRef]
5. Llach, J.; Perramon, J.; Alonso-Almeida, M.D.M.; Bagur-Femenías, L. Joint impact of quality and environmental practices on firm performance in small service businesses: An empirical study of restaurants. *J. Clean. Prod.* **2013**, *44*, 96–104. [CrossRef]
6. Wang, Y.F.; Chen, S.P.; Lee, Y.C.; Tsai, C.T.S. Developing green management standards for restaurants: An application of green supply chain management. *Int. J. Hosp. Manag.* **2013**, *34*, 263–273. [CrossRef]
7. Dogan, H.; Nebioglu, O.; Demirag, M. A Comparative Study For Green Management Practices in Rome and Alanya Restaurants From Managerial Perspectives. *J. Tour. Gastron. Stud.* **2015**, *1*, 3–11.
8. Teng, Y.M.; Wu, K.S. Sustainability development in hospitality: The effect of perceived value on customers’ green restaurant behavioral intention. *Sustainability* **2019**, *11*, 1987. [CrossRef]
9. Hu, H.H.; Parsa, H.G.; Self, J. The dynamics of green restaurant patronage. *Cornell Hosp. Q.* **2010**, *51*, 344–362. [CrossRef]
10. Yu, Y.S.; Luo, M.; Zhu, D.H. The effect of quality attributes on visiting consumers’ patronage intentions of green restaurants. *Sustainability* **2018**, *10*, 1187. [CrossRef]
11. Jang, Y.J.; Kim, W.G.; Bonn, M.A. Generation Y consumers’ selection attributes and behavioral intentions concerning green restaurants. *Int. J. Hosp. Manag.* **2011**, *30*, 803–811. [CrossRef]
12. Hatjathanassiadou, M.; Souza, S.R.G.D.; Nogueira, J.P.; Oliveira, L.D.M.; Strasburg, V.J.; Rolim, P.M.; Seabra, L.M.J. Environmental Impacts of University Restaurant Menus: A Case Study in Brazil. *Sustainability* **2019**, *11*, 5157. [CrossRef]
13. Maynard, D.D.C.; Vidigal, M.D.; Farage, P.; Zandonadi, R.P.; Nakano, E.Y.; Botelho, R.B.A. Environmental, Social and Economic Sustainability Indicators Applied to Food Services: A Systematic Review. *Sustainability* **2020**, *12*, 1804. [CrossRef]
14. Vu, H.M.; Chan, H.K.; Lim, M.K.; Chiu, A.S.F. Measuring business sustainability in food service operations: A case study in the fast food industry. *Benchmarking* **2017**, *24*, 1037–1051. [CrossRef]
15. Perramon, J.; Alonso-Almeida, M.M.; Llach, J.; Bagur-Femenías, L. Green practices in restaurants: Impact on firm performance. *Oper. Manag. Res.* **2014**, *7*, 2–12. [CrossRef]
16. Gusukuma, L.W.; Silva, H.T.; Pestana, J.O.M. Risk assessment score in pre-kidney transplantation: Methodology and the socioeconomic characteristics importance. *J. Bras. Nefrol.* **2014**, *36*, 339–351. [CrossRef]
17. Farage, P.; Zandonadi, R.P.; Ginani, V.C.; Gandolfi, L.; Nakano, E.Y.; Pratesi, R. Gluten-free diet: From development to assessment of a check-list designed for the prevention of gluten cross-contamination in food services. *Nutrients* **2018**, *10*, 1274. [CrossRef]
18. Maynard, D.D.C.; Zandonadi, R.P.; Nakano, E.Y.; Botelho, R.B.A. Sustainability Indicators in Restaurants: The Development of a Checklist. *Sustainability* **2020**, *12*, 4076. [CrossRef]
19. ABNT Iso 14001. *Sistemas de Gestão Ambiental-Requisitos com Orientações para uso (Environmental Management Systems-Requirements with Guidance for Use)*; Associação Brasileira de Normas Técnicas: Rio de Janeiro, Brazil, 2015.
20. ABNT NBR ISO 14004:2005. Available online: <https://www.abntcatalogo.com.br/norma.aspx?ID=1555> (accessed on 2 March 2020).
21. SRA Sustainable Restaurant Association. Available online: <https://thesra.org/about-us/> (accessed on 12 December 2018).
22. Green Restaurant Association Green Restaurant Association | Sustainability | Certification. Available online: <https://www.dinegreen.com/> (accessed on 2 March 2020).
23. Green Seal. *GS-55 Green Seal Standard for Restaurants and Food Services*; Green Seal: Washington, DC, USA, 2014.
24. Teles, J.S.; da Silva, S.M.T.; Sousa, D.S.; Moraes, Freitas, C.R. Aplicação do semáforo nutricional em rótulos de biscoitos integrais/Application of nutritional semaphorus on integral biscuit labels. *Hig. Aliment* **2019**, *33*, 67–71.
25. Karagiannis, D.; Andrinou, M. The Role of Sustainable Restaurant Practices in City Branding: The Case of Athens. *Sustainability* **2021**, *13*, 2271. [CrossRef]
26. Teng, Y.M.; Wu, K.S.; Huang, D.M. The influence of green restaurant decision formation using the VAB model: The effect of environmental concerns upon intent to visit. *Sustainability* **2014**, *6*, 8736–8755. [CrossRef]
27. Sarmiento, C.V.; El Hanandeh, A. Customers’ perceptions and expectations of environmentally sustainable restaurant and the development of green index: The case of the Gold Coast, Australia. *Sustain. Prod. Consum.* **2018**, *15*, 16–24. [CrossRef]
28. Ludovice, B.C.; Souza, A.C.; Fraga, L.N.; de Carvalho, I.M.M. SUSTENTABILIDADE AMBIENTAL NOS SERVIÇOS DE ALIMENTAÇÃO HOSPITALAR. *Mix Sustentável* **2020**, *6*, 45–54. [CrossRef]

29. Jones, R.; Wham, C.; Burlingame, B. New zealand's food system is unsustainable: A survey of the divergent attitudes of agriculture, environment, and health sector professionals towards eating guidelines. *Front. Nutr.* **2019**, *6*, 1–16. [CrossRef]
30. Cook, P.M.; O'Dwyer, D. Analysis of sustainable food practices in Texas acute care hospitals. *ProQuest Diss. Theses* **2015**, 153. Available online: <https://about.proquest.com/en/dissertations/> (accessed on 12 April 2021).
31. Wen, Z.; Wang, Y.; De Clercq, D. Performance evaluation model of a pilot food waste collection system in Suzhou City, China. *J. Environ. Manag.* **2015**, *154*, 201–207. [CrossRef]
32. Tomio, M.; Schmidt, C.M. A Sustentabilidade Da Água Em Pequenas Empresas: O Desafio Dos Restaurantes De Blumenau, Sc. *Rev. Gestão Sustentabilidade Ambient.* **2015**, *4*, 31. [CrossRef]
33. Tilman, D.; Clark, M. Global diets link environmental sustainability and human health. *Nature* **2014**, *515*, 518–522. [CrossRef]
34. Takacs, B.; Borrion, A. The use of life cycle-based approaches in the food service sector to improve sustainability: A systematic review. *Sustainability* **2020**, *12*, 3504. [CrossRef]
35. Baldwin, C.; Wilberforce, N.; Kapur, A. Restaurant and food service life cycle assessment and development of a sustainability standard. *Int. J. Life Cycle Assess.* **2011**, *16*, 40–49. [CrossRef]
36. da Silva, R.M. Energia Solar no Brasil: Dos Incentivos aos Desafios. Available online: <https://www2.senado.leg.br/bdsf/bitstream/handle/id/507212/TD166-RutellyMSilva.pdf> (accessed on 12 April 2021).
37. Tomaszewska, M.; Bilska, B.; Tul-Krzyszczuk, A.; Kołożyn-Krajewska, D. Estimation of the scale of food waste in hotel food services—A case study. *Sustainability* **2021**, *13*, 421. [CrossRef]