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Evaluation of environmental sustainability actions in commercial restaurants in the city of São Paulo, Brazil

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Abstract

Among the national industries that still are unaware of environmental management is the foodservice segment. . Although considered recent, wastes from this industry constitute a considerable portion of pollutants in the environment and proper disposal becomes critical to environmental preservation. This study aimed to evaluate actions for environmental sustainability in commercial restaurants located in the municipality of São Paulo. Data were collected through interviews using a structured questionnaire with questions about wastes destination, reuse of meals leftovers; volume of disposal of organic material and destination; types of packaging used; selective collection of recyclables; separation of recyclables based on color coding of Conama Resolution n. 275/2001; and destination of frying oil. Among the most significant findings was the lack of awareness about the responsibility for the preservation of the environment, since 37.5% of the managers do not take actions against this degradation. However, there is a greater environmental awareness regarding the disposal of frying oil. In 75% of the restaurants, the largest source of disposal of raw materials is in the post-production step, resulting in a large volume of organic wastes and wasted foods; 87.5% perform selective collection of recyclables, and among them , only 18.8% use containers with different colors for recyclables.

Keywords: Environmental Impact. Sustainability. Restaurants. Waste Management.

Introduction

Today' society is experiencing changes in the eating patterns, along with factors that prevent people from having their meals at home due to lack of time to prepare and consume foods, which explains the ever-growing number of restaurants.[1]

Among the national industries that have not yet awaken to environmental management is the segment of foodservice. Although considered recent, the wastes from the activities of this industry account for a considerable number of pollutants in the environment. Proper wastes disposal is crucial for preservation of the environment.[2]

Corrêa & Lange[3] argue that there is some urgency in standardizing wastes management, since the amount of wastes produced and the forms of disposal constitute sufficient criteria to include this industry among those that have negative impacts on the environment, as defined in law. Such recommendation is not just based on the dimension and importance of this industry to the national economy, but also because of the polluting potential of the wastes generated by this industry, which require a careful, strict assessment by the environmental agencies.

In today's world, the environmental impacts caused by the production and consumption of foods made in an unreasonable way are leading to an increasing number of researches and policies, in which nutrition professionals should be included.[4] The nutritionist, when managing a foodservice (FS), should look for alternatives to preserve the environment and optimize the use of raw materials.[5,6]

Given the abovementioned problems, the aim of this study is to examine the environmentally sustainable actions developed by restaurants located in the city of São Paulo, Brazil.

Theoretical framework

According to Van Bellen,[7] society's perception of the environmental impacts and consequent degradation resulting from the development process has increased since the late twentieth century, along with a reflection on the society's influence on this process of environmental crisis.

Environmental management, according to Tinoco & Kraemer[8], is a "system that includes the organizational structure, planning activities, responsibilities, practices, procedures, processes, and the resources to develop, implement, achieve, analyze critically, and maintain the environmental

policy." (authors' translation). Thus, environment management can be understood as the practices adopted by a business or industry to minimize the impacts caused by their activities on the environment. It is therefore vital to introduce recycling programs, as well as energy-saving measures and other ways to prevent environmental degradation.

In today's world, consumption has the capacity of causing an abusive, energy-intensive exploitation of mineral resources, which produces a great amount of wastes. Great part of the wastes is disposed of in landfills, without an appropriate structure, resulting in the contamination of the surrounding soils and waters.[9]

According to Schenini, Cardoso & Rensi,[10] "industries use the resources that nature and society make available through their production activities, and in exchange provide products and services to society. But such production processes, besides wealth, also generate social and environmental costs." (Authors' translation).

According to Cavalcanti,[11] "In order to achieve sustainable development, protection of the environment must be understood as part of the process of development and cannot be considered apart." (Authors' translation). In this context, sustainable foods processing should not just be limited to production and processes that use natural resources and generate various types of wastes. Even when the production cycle is completed and the final product reaches the consumer's table, the impact still exists, caused by the disposal of leftovers, packaging, use of non-biodegradable chemical products, and water and energy wasted during the diverse stages of the production process.[3]

Food production becomes an important issue from the economic and environmental point of view, because the processing of raw materials utilizes multiple production techniques and generates organic and inorganic wastes, besides packaging wastes, which are valuable products that could be reused.[12]

Castellanelli et al.[13] report that because of the lack of information available to the population, the remainder of cooking oil produced in the houses, industries and establishments are directly discharged into the water, such as rivers and streams, and often into sinks and toilets. Consequently, these residues will go to the sewer network, causing clogs of drains and pipes, more money spent on treatment processes, and pollution of the aquatic environment.

Thus, the solution for the problem of wastes generation involves the society's environmental awareness in general, thus becoming an educational issue, which cannot be addressed as an isolate fact but should bring along strategic programs and actions by corporations and industries.[12]

Method

It is a cross-sectional study conducted in 16 restaurants in the perimeter of Campo Belo neighborhood, in the southern region of the city of São Paulo. The establishments were selected based on the following criteria: i) self-service restaurants only; ii) agree to participate in the survey.

As a criterion for the interviews, it was defined that the interviews would be conducted only with the owner or manager of the restaurant. Data were collected in the interviews, using a questionnaire with open, multiple-choice questions, which were adapted from Bilck et al.,[14] and are illustrated in chart 1.

The sensitivity analysis of the questions counted on the knowledge of the owner or manager on the basic factors relating to the themes cited above.

In order to ensure the anonymity of the enrolled restaurants, it was used the abbreviation of "restaurant" followed by letters (e.g. Rest A; Rest B), in the descriptions of the results and discussion.

The project complied with the guidelines and norms that govern the researches involving human beings, which are included in the bioethics code and Brazilian laws (Resolution nº 196/96). The Research Ethics Committee of Mackenzie Presbyterian University examined and approved the ethics-related procedures described in the project, registered under CAAE no. 13606713.1.0000.0084.

Data were tabulated and presented through the distribution of variables in number and percentage, with the help of Microsoft Office Excel® software, 2010 version.

Chart 1. Basic questionnaire used in the visits to the restaurants

1) What production step generates the largest amount of disposals of raw materials?
( ) Storage ( ) Pre-preparation ( ) Preparation ( ) Post-production
2) During foods preparation, is there any instruction given to the employees to make maximum use of raw materials, such as stalks, leaves, peels, among others? ( ) Yes ( ) No
If so, which ones? _____
3) How are the meal quantities planned to reduce wastes? Mark with an (X) the options that are performed in your establishment.
( ) Study of the number of customers per period/day
( ) Preparations are chosen according to the season
( ) Participation of all staff in the definition of achievable goals for the control of leftovers.
( ) Program of staff training, qualification and awareness
( ) Application of the correction factor
( ) Others:_____
4) What is done with meals leftovers?
5) If leftovers are reused, how is it done?
( ) Employees take it home ( ) Reuse in alternative dishes ( ) Sauces, juices and garnishes
( ) Others:_____
6) What is done with plate leftovers (food left uneaten by customers)?
7) Which are the foods that are often left uneaten on the customers' plates?
8) Is it possible to donate leftover food that is not reused? Are there any constraints, obstacles?
9) What is the daily amount of organic wastes disposal? What is its destination?
10) Does the establishment perform selective collection of recyclables? ( ) Yes ( ) No - If so, what is the amount generated in a month?
11) What types of packaging does the restaurant use in the buffet /delivery service? ( ) aluminum ( ) paper
( ) plastic
12) What is the average amount of packaging units used per month?
13) Please list in ascending order, according to the amount, the wastes produced in the establishment:
( ) Cardboard ( ) Plastic ( ) Metals ( ) Glass/ porcelain ( ) Organic wastes ( )
Others:_____
14) What is the amount of oil that is left in a week after cooking? How is it disposed of?
15) Is there any concern with environment degradation? Is there any action that management and employees perform? Is there any obstacle or problem that you would like to be solved?

Results and discussion

Eighteen kilo and self-service restaurants located in Campo Belo neighborhood, in the Southern region of the city of São Paulo were contacted. However, the survey enrolled only 16 restaurants because for two of them, despite several attempts, there were difficulties in finding the owners or managers.

In 14 self-service establishments, the kilo price of the meals varied from R$ 27.90 and R$ 39.90 (average R$ 31.13 ± 3.63 SD). Two restaurants were not included in the average price/kg calculation because they offered buffet-type service charged per person.

Regarding the average daily number of meals served, 68.8% (n=11) of the restaurants serve less than 200 meals/day, and 31.2% (n=5) more than 200 meals/day.

In a foodservice (FS), wastes can be in the form of leftovers of foods prepared and not served, and foods served and left uneaten on the plate. [6,15] The implementation of a waste-control system allows detecting cost-intensive practices and at the same time it creates mechanisms that help meet the goals defined by each foodservice unit[16].

In the foodservices production stages one can find the greatest potentials to generate or control wastes. Therefore, all stages – office work for planning and control the services; storage and control of raw materials; pre-preparation and distribution of meals; and training of the staff in foods handling – are critical to this kind of management.[17] To prevent wastes, it is necessary to plan the number of meals as precisely as possible; ensure the commitment of all staff in defining achievable goals regarding leftovers; prepare the foods as needed, i.e., produce only what and when it will be consumed; maintain an excellent presentation of the dishes. [18]

According to Ribeiro,[19] wastes control should also be monitored during the foods pre-preparation stage, and to optimize the techniques involved in this stage, economic criteria should be considered. For this, it is recommended to use the correction factor, an index that determines the ratio of the gross weight to the net weight (after removal of inedible parts), thus indicating the percentage of food losses.[20]

Although 100% (n=16) of the restaurant samples employed tools designed to reduce wastes, it was observed that in 75% (n=12) of the units, the largest amount of disposal of raw materials occurred in the post-production stage, which indicates possible losses and a great volume of organic wastes generated by the restaurants. In 19% (n=3) of the establishments, wastes were found mostly in pre-preparation, indicating lack of training of the staff. Only one restaurant (6.2%) mentioned storage as the most important stage in which wastes often occur, which may indicate poor planning of purchase and storage of foods.

Storage of foodstuffs in a foodservice unit is a critical quality control stage, in which raw materials should be kept in conditions that ensure protection against contamination, reduction of losses of the nutritional quality and preservation of the product.[21]

Figure 1 represents the results obtained from the question relating to the tools used to plan the amount of meals and reduce wastes.

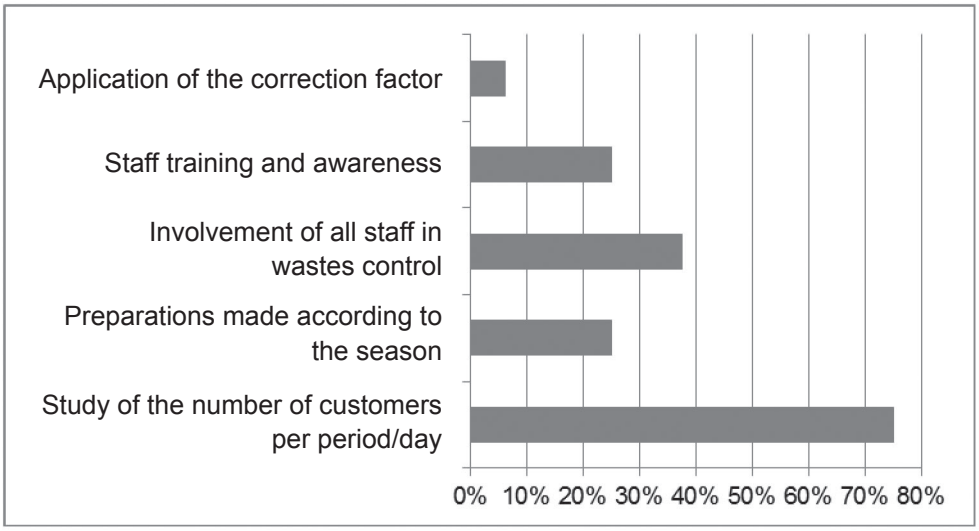

Figure 1. Distribution of the tools used by the restaurants to reduce wastes. São Paulo-SP, 2013.

Sustainability actions developed by foodservices should also include secondary uses of foods. The less conventional parts of the foods – although edible – such as vegetable trimmings (skins, peels, leaves, and stalks) can be used for other purposes, thus reducing the disposal in the environment and the resulting pollution. In the present study it was found that 62.5% (n=10) of the establishments achieve optimum use of raw materials by using vegetable stalks, peels, among others.

In order to know how much food is being thrown away, Freund [22] asserts that the first step is wastes control. The author also claims that, when employees are poorly trained or are dissatisfied with their jobs, a large portion of foods is wasted during cleaning and most of them are unaware of the importance of reusing foods. According to Lustosa,[23] a simple alternative to reduce the generation of organic wastes would be an adaptation of menus, including recipes that use fruit or vegetable trimmings or preparations that do not require peeling.

According to the owners and managers of the establishments participating in this study, the foods that are often entirely used include leaves of salads and broccoli, vegetables, and fruits. Some were more specific, like the manager of restaurant "B", who reported the decision of using some parts of meat pieces, e.g. the side muscle of tenderloin, to make broth or stroganoff. The owner of restaurant "J" said that he instructs the staff to use pineapple skin to make tea, and the watermelon rind to make jams or preserves. Santana & Oliveira[24] conducted a study in which preserves and creamy deserts were made using watermelon rind. As positive results of the study, the authors reported that the use of watermelon rind is economically viable, once it is a traditionally wasted raw material.

With optimum use of food leftovers, it is possible to produce in larger scale and reduce the amount of garbage disposed of in the environment and wastes treatment costs.[14] In foodservices, wastes reduction and optimization of the use of raw materials are socially responsible actions, while reduction of leftovers is an environmental responsibility.[25]

It was found that 25.0% (n=4) of the surveyed establishments use leftovers in other dishes, while 37.5% (n=6) dispose of all leftovers. Other restaurants (18.8%) (n=3) consume leftovers internally (staff's meals) and to make pies; 12.5% (n=2) donate the foods to the homeless; and in 6.2% (n=1) of the units, leftovers and cooking oil are collected by a third company.

It is worth emphasizing that the reuse of leftovers must be made with unserved, surplus foods, which must be monitored for the time and temperature of storage to prevent microbial growth and the occurrence of diseases caused by poorly preserved foods. [26]

It could be seen in the present study that some respondents were not updated with respect to current legislation. When asked about the possibility of donating the leftovers, 12.5% (n=2) of the participants said: "We would like to donate, but according to law we can't" (Rest B) or "Health inspectors do not allow donation" (Rest P). However, according to CVS Ordinance no. 5 of April 09, 2013, article 51:

> *It is allowed the reuse of foods for free donation, including leftovers from any production stage, provided that the foods have been prepared in compliance with the Best Practices described herein, added to other provisions set forth by current sanitary legislation. Food leftovers do not include uneaten food by customers.* [27] *(Authors' translation).*

Figure 2 illustrates the destination of non-reusable leftovers from the surveyed restaurants. It can be seen that the difference between the number of restaurants that donate and those that do not is small.

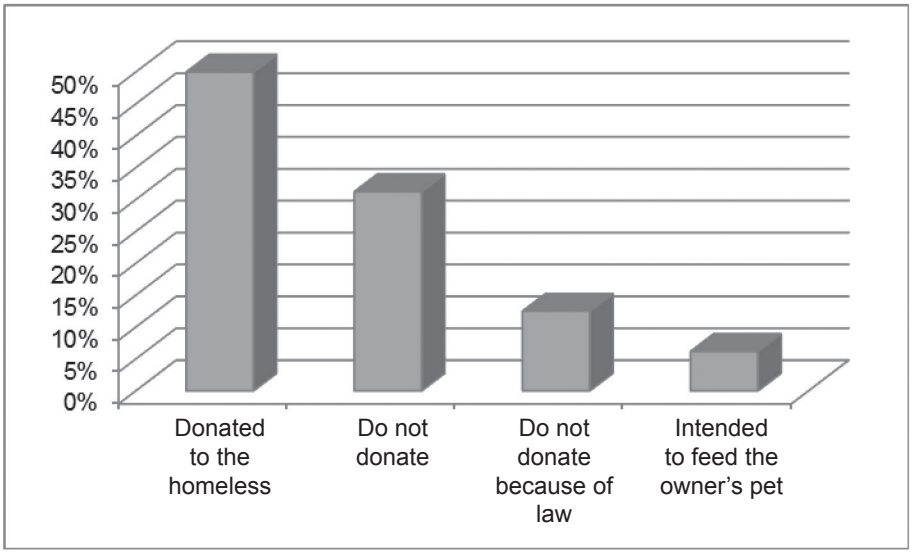

Figure 2. Destination of non-reusable food leftovers in the surveyed restaurants. São Paulo-SP, 2013.

In a study conducted by Silva,[28] a gastronomic restaurant in Taubaté, SP uses the leftovers in the staff's meals, and the surplus is given to the employees to take it home, similar to what was found in this study. However, if this procedure is not well planned, it may encourage employees to increase production deliberately, and the consequence is increased leftover amounts.

According to Abreu, Spinelli & Souza Pinto,[6] leftovers should not be assessed only from the economic point of view, but also as poor integration with the customer. One should assume that if the foods are well prepared, leftovers should be close to zero, which indicates that in restaurants where customers pay by the weight of food, they know the amount that they should eat.

In a study conducted by Augustini et al.[18] in a foodservice unit of a metallurgical industry in Piracicaba-SP, an analysis of the ratio of leftovers to the amount of meals produced was used to assess the wasted amount derived from menu dissatisfaction and inadequate serving sizes by the user. The authors found that the amount of food wastes was enough to feed 11,442 people, and also reported that the higher this index was, the lower the consumers' satisfaction was. The importance of controlling food scraps and the investigation of the reasons of such occurrence allow assessing the quality and efficiency of the services, in which the nutritionist plays a key role to avoid possible wastes. [29]

A nutritionist was available in 50.0% (n=8) of the establishments, either as an employee or outside consultant.

In the sustainability context, it is vital that the nutritionist knows his/her role in relation to the environment, to monitor it constantly and define strategies to reduce wastes, electric power, and water consumption, among others. Such role also involves training of the staff and the users' awareness.[6]

Among the 62.5% (n=10) establishments that claimed being concerned with environmental degradation, 31.2% (n=5) mentioned that the actions taken in this regard consisted of separating recyclable wastes; 18.8% (n=3) cited proper disposal of cooking oil; and 12.5% (n=2) reported that their concern with the environment was focused on the product used in the preparation of barbecue included in the self-service menu. One of the establishments reported that they did not burn wood and used a gas barbecue grill instead, and another mentioned that the quantity of charcoal purchased in a month is printed in the invoice, and at the end of the year such amount is passed to the selling company for reforestation of the trees cut for this purpose.

Among the six restaurants (37.5%) without any kind of concern or action regarding environment degradation, a respondent made the following statement: "We are concerned, but at the same time we do nothing about it. The problem or obstacle is ourselves!" (Rest P).

The above statement was from one of the owners of the restaurant that has the greatest number of meals served per day in the neighborhood, reaching an average of 400 meals served at lunch. In addition, according to the respondent, the daily volume of organic wastes disposal corresponds to two 100-liter plastic bags, and the unit does not have selective collection of recyclables.

The total amount of organic wastes generated by 14 restaurants (87.5%) was estimated in 2,190 liters/day. Two restaurants (12.5%) were not included in the calculation because they could not inform the amount of trash generated in a day.

Table 1 shows the assessed environmental sensitivity of the staff regarding the sustainability practices developed in the surveyed foodservices.

Table 1. Distribution of the restaurants according to sustainable practices in number and percentage. São Paulo-SP, 2013.

DISTRIBUTION OF RESTAURANTS ACCORDING TO SUSTAINABLE PRACTICES	n	%
Solids are separated from organic products		
Yes	12	75.0
No	4	25.0
Destination of organic wastes		
Collected by the city garbage service	7	43.8
Collected by a cooperative	9	56.2
Selective collection of recyclables		
Yes	14	87.5
No	2	12.5
Uses containers with distinct colors for recyclables		
Yes	3	18.8
No	11	68.7
Destination of recyclables		
Collected by the city garbage service	2	12.5
Collected by a cooperative	8	50.0
Collected by the homeless	4	25.0
Destination of cooking oil		
Collected by a cooperative	16	100
Poured into the sink/sewer	0	0.0
Destination of leftovers (uneaten food by customers)		
Trash bin	16	100
Sink/ sewer	0	0.0
Concern with environmental degradation		
Yes	10	62.5
No	6	37.5

*The following practices developed by the restaurants: **Uses containers with different colors for recyclables** and **Destination of recyclables** do not reach 100% because they questions are only applicable to the restaurants that have selective collection of recyclables, corresponding to 87.5% of the units.

The above table shows that the majority of the restaurants separates recyclables. According to the Brazilian Institute of Geography and Statistics (IBGE), although the country is the world record holder of aluminum cans recycling and has increased paper recycling every year, collection of recyclables is still in an initial stage. It is known today the great importance of the present society in reducing wastes, once the wastes increase has caused an enormous environmental impact, especially of recyclables, which can take more than hundred years to decompose.[30]

The National Environment Council (Conama),[31] considering that wastes recycling should be encouraged, facilitated and expanded in the country to reduce the consumption of raw materials, non-renewable natural resources, energy and water, issued the Resolution no. 275, of April 25, 2001, the colors coding for different types of recyclable wastes. However, this study showed that 87.5% (n=14) of the restaurants that are engaged in the separation of wastes for recycling, only 18.7% (n=3) have in their facilities containers with different colors for each kind of waste.

Menezes, Neves & Ferreira[32] consider recycling as a set of techniques with the purpose of reusing wastes and refuses and reintroduce them into the production cycle. Wastes recycling has several advantages over the use of natural resources, such as the preservation of these resources, extending their useful life and diminishing destruction of landscape, habitats, fauna and flora.

The waste generated in restaurants and foodservices in general are paper, cardboard, metals, glass, trimmings and scraps from the pre-prep of foods, and uneaten food left by customers.[33] Separation of organic wastes (food leftovers, fruit peels, skins, etc.) from inorganic wastes (paper, glass, plastic, etc.) makes recycling much easier, because when materials are cleaner they have a greater likelihood of being reused and marketed.[34] The present study showed that 75% (n=12) of the establishments separate solid wastes from organic wastes.

With respect to the types of wastes that are produced in larger amounts by the restaurants, in the first place were organic wastes; second, cardboard; third, plastics; fourth, metals; and fifth, glass/porcelain. According to Vilhena & Silva,[35] Brazil generates nearly 100 thousand tons of trash per day, and about 60% consists of organic matter – in general, fruits, vegetables, greens and food leftovers. However, only 1% of such wastes are reused.

Organic wastes are the main source of environmental impacts, because the slurry produced by decomposition produces a great amount of organic matter, microorganisms, heavy metals and other substances that may be harmful to the environment. [36] All restaurants reported that they throw food leftovers into the trash bins, and do not use garbage disposals under the sink, for example. Only one respondent (6.2%) reported that the restaurant separates organic wastes to make fertilizer (Rest N).

In addition to solid organic wastes, recyclables and common non-recyclable wastes, there is also a liquid waste, cooking oil, which cannot be poured down the kitchen drain because it is a source of environmental pollution.

According to the Basic Sanitation Company of the State of São Paulo (SABESP),[37] the oil composition, based on esters of fatty acids, does not make it difficult to degrade, but its insolubility in water reduces the contact of the oil with microorganisms capable of digesting and degrading the oil droplets in emulsion.

The total estimated amount of cooking oil that is accumulated in a week by all restaurants is 445 liters, and the average is 27.8 liters (± 22.2 SD), and 100% (n=16) of the restaurants the oil is stored in containers and collected by a third company. From 100% (n=16) restaurants, in 56.2% (n=9) the company that collects the cooking oil leaves in exchange cleaning products such as soap, bleach and detergent.

According to a study conducted by Bilck et al.,[14] one of the restaurants produces 25 to 30 liters of cooking oil per week, and the solution for disposal consists of storing the cooking oil used, which is collected later by a volunteer and destined to make soap.

Concerning the packaging options used in the buffet and delivery services, it was found that disposable aluminum foil packaging had a higher preference among the restaurants' owners, followed by expanded polystyrene (Styrofoam). Only one unit (6.2%) does not use any type of packaging (Rest A).

In the case of foil packaging, it is not significant in the recycling process because it contains other components associated with aluminum and this kind of container easily retains organic residues, which compromises the quality of the material for recycling.[38]

According to the Brazilian Association of Expanded Polystyrene (ABRAPEX),[39] EPS is the international abbreviation for expanded polystyrene, as defined by DIN ISO-1043/78. In Brazil, is commonly known as "styrofoam®", a trademark.

Styrofoam® is a plastic that, among other features, preserves the temperature of beverages and foods without contaminating them. It is 100% recyclable; it is not soluble in water and does not release substances into the environment.[40]

Conclusion

Environmental management requires sensitization and awareness of all individuals involved in foodservices, because the efficiency of the services provided and the quality of the product offered may depend on the implementation and functionality of diverse quality aspects of the unit. Quality in the food industry is not limited to the provision of healthy meals and hygiene-sanitary conditions; its scope is much larger and involves numerous factors, among them socio-environmental responsibility.

It is also observed the lack of awareness regarding the responsibility for environment preservation, once 37.5% of the respondents are not concerned with environmental degradation or even think about the possibility of implementing any environmental management program.

Final considerations

In addition to the sensitization and awareness of managers and owners of foodservices, the importance of public administration is clear in the collection of recyclables, wastes treatment and the required infrastructure, which would possibly enlarge its scope and improve efficiency regarding sustainability and, consequently, the well-being of present and future generations.

In the specific case of the of foodservices industry, laws concerned with environmental sustainability are vital, once the transformation process of raw material by this industry can generate a considerable amount of organic, recyclable or non-recyclable wastes.

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