https://dx.doi.org/10.22161/ijaers.611.64 *ISSN: 2349-6495(P) | 2456-1908(O)*

Destination of Organic Waste Produced at Manaus Free Fairs

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Abstract**—** *Free fairs have always been the target of many regulars, which leads to producing tons of organic waste, but do not always have an efficient destination mechanism for organic waste. A correct disposal of waste is of paramount importance, as it prevents them from going into the process of decomposition in inappropriate places. In this phase, the release of slurry occurs, liquid that can contaminate soil and groundwater. The work aimed to point out the visible problems caused by organic waste, map and make comparisons between the main free fairs of Manaus, besides promoting a correct destination for organic waste produced in them. It was possible to analyze that the healthiness of free fairs are going unnoticed, with this it is clear that the disposal of organic waste is not receiving due attention. Through the questionnaire applied to fairs, consumers and waste pickers, a negative result was obtained regarding the infrastructure of free fairs.*
Keywords**— Manaus Open Market, Organic Waste.**

I. INTRODUCTION

Free fairs were born from the simplest marketing mechanism, the exchange, which over the years became recurrent. The fairs in Brazil were an inheritance of the Portuguese colonizer, due to the need for supply (PINTOR et. al., 2011). In Guimarães (2010) show that the records point to the year 1914 the creation of the first Free Fair in the state of São Paulo. From that moment on free fairs have become common place across the country.

The free fair in Brazil is a type of outdoor retail market modality, of weekly periodicity, organized as a utility service by the municipality and focused on the local distribution of foodstuffs and basic products (MASCARENHAS,2008).

In Brazil, 60% of food production is discarded before reaching the dish. This represents a total of 39,000 tons of food converted into garbage per day, which could feed 19 million people or 1.3 billion tons per year, considering the three meals a day (CREUS, 2018).

Also, Sampaio (2017) presents in his study that thousands of tons of fruits, vegetables and vegetables that could go to the Brazilian dish, will end up right in the trash. In addition to waste, in free fairs of Manaus, organic waste causes aesthetic and environmental disorder, because organic waste in general that are accumulated, cause disgust to consumers, who in certain situations stop buying, opting to go into big markets (SOARES *et. al.*, 2013).

The accelerated growth of the population is directly proportional to the level of waste, and uncontrolled consumption causes pollution and environmental impacts increasingly present in our society, causing more areas to be deforested to meet the man's needs. The accelerated growth of the population is directly proportional to the level of waste, and uncontrolled consumption causes pollution and environmental impacts increasingly present in our society, causing more areas to be deforested to meet the man's needs (BACKES, 2007). The slurry the dark-looking liquid, which is formed during the decomposition of organic waste, can pollute the soil and reach the groundwater i.e. leading to water pollution. With an adequate destination of organic waste, the impact can be mitigated (SERAFIM et. al., 2003).

Thus, this research aimed to analyze the treatment of organic waste from Manaus free fairs and how waste is generated, map the main free fairs of the city and its characteristics. In addition, obtain information on the disposal and treatment procedure of waste generated at free fairs and develop an appropriate disposal procedure.

II. METHODOLOGY

Located in the northern region of Brazil, the municipality of Manaus/AM currently has a population of 2.1 million inhabitants. The 45 free fairs in the city are controlled and administered by the Municipal Department of Public Cleaning (Semulsp) (MARRECO, 2019). To

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carry out the case study, the five main free fairs of the city of Manaus were selected: Rural Producer Fair, *Banana* Fair, *Panair* Fair, *Sepror* Fair and the Free Fair of the Coroado.

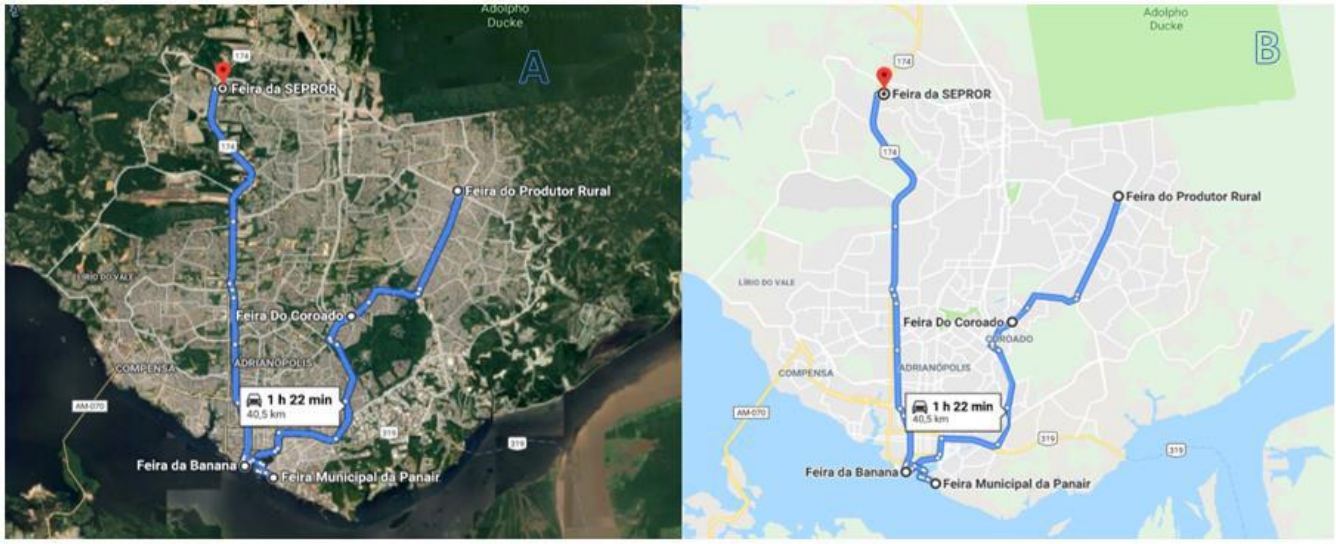

Fig.1: a) actual location of the five free fairs; b) fixed location of the five free fairs
Source: Maps Google

Fig.2: Localização das distancias entre as feiras
Fonte: Maps Google

The methods covered in this project are qualitative, being developed through on-site visit, interview, photographic records, observation and bibliographic searches. The purpose of the visit to the site was to analyze the production of organic waste, disposal, map the main free fairs of Manaus, make the comparison between the main free fairs, and the destination of organic waste.

First, a study was conducted for the characteristic of the five main free fairs of Manaus, which assisted the field research from March to September 2019. The information collection technique was possible through the application of questionnaires of easy understanding (SANTOS, 1999), where the intention was to evaluate the perception of the interviewees about the accelerated production of waste at the fairs. The questionnaires were applied with fairs, consumers and homeless people. In total, 10 questions were elaborated, where three of them were directed to 75 fairs, four to 100 consumers and three to 50 homeless people, totaling 225 people.

Subsequently, the main weaknesses of the fairs were detected, and with the information obtained, the project of "Portable Compost separator" was developed. The compost separator was manufactured from PVC buckets with a capacity of 20 liters, in addition, were tested at only two free fairs belonging to the study. In

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parallel with the project, explanatory booklets were developed on the use of the "Portable Compost separator".

III. RESULTS

Through on-site visits, visual analyses, and application of questionnaires with fairs, consumers and residents, it was possible to understand the logistics of free fairs in Manaus. At first, it was clear that the exaggerated disposal of organic waste found at the end of activities at the fair, cause disorders such as, visual, smelly, proliferation of rodents, as well as cockroaches, pompoms, worms and vultures.

However, with the application of the questionnaires it was possible to observe that fairs, consumers and waste pickers, are unaware of the destination of tons of waste that are generated every day at the fairs. In addition, most fairgoers interviewed showed no concern in possible solutions to the quantitative easing of waste generated. On the other hand, consumers have described as regrettable the waste situation, as there are many people who are experiencing precariousness.

According to the administrator of the Coroado fair, an awareness is made with fairs wore at their respective sales stand, to separate organic waste and non-organic waste, thus the destination could be directed in places Differentiated. Contrary to what happens today, where waste is deposited in the same garbage truck and thus taken to the controlled landfill of the city. The street dwellers interviewed showed that they remove discarded food in good condition for consumption.

The five free fairs analyzed presented the same deficiencies/ and or problems in relation to the loss of the organic waste generated, an example of the form of disposal can be observed in Figure 3.

Fig.3: a) Deposition of waste at the Coroado free fair; b) Storage of foods that are donated- Coroado Fair

Although the fairs did not present a correct form of disposal, the Coroado fair did not show a high number of disposals of organic waste. The reduction in waste is due to the existence of a Venezuelan refugee shelter, which collect part of the discarded usable waste. In addition, fairs wore donate those foods that are not in standard for sale, but can be consumed, this are deposit in cardboard boxes until the residents of the shelter collect.

It was possible to verify that the higher production of waste comes from the kiosk's restaurants, which sell food at low cost. The residues generated by these kiosks are vegetable and fruit peel, fat and animal viscera, which are discarded directly to the garbage truck along with the other solid waste of the fair.

The free fairs in the Amazon have a peculiarity that is the sale of fresh fish, which generates considerable volume of viscera that are discarded. But unlike plant residues, the viscera are cast in the open to feed vultures.

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Fig.4: a) Disposal of waste from the Rural Producer's fair; b): Accumulation of organic waste after the end of the fair

At the Rural Producer's fair, the disposal is carried out through the rotation of four employees of the fair who constantly carry out the collection. Unfortunately, fairs and employees who perform the collection do not care to perform the separation between organic and non-organic waste. In addition, they do not separate products that although not saleable are in good condition for consumption. This waste is taken directly to the collector truck, serving the fairs wore for 12 hours. One point analyzed is the lack of environmental awareness on the part of the fairs wore, the fair at many points has very disordered aspect, shells and stems of organic waste are present at all times at the fair.

Despite the absence of a process of separation of organic waste, and food in good condition or not, employees allow homeless people to collect the waste. Also, at the Producer's fair there is a mechanism for the donation of organic waste, but fairs donate to small producers to serve as food to animals. However, there are no garbage trucks collectors, given that the waste collector truck is available to the fairs wore until the closing of the fair.

Located in the historic part of the city of Manaus, the *Panair* fair has undergone renovations since its creation. Among some positive characteristics at the fair, we highlight the cleaning, organization of the stands for the sale of products, but the structure of waste still causes problems. It was found that the fairs wore were highly aware both in the area of waste generated and in the cleaning of the site. Waste in good condition is donated Fridays to NGOs, and groups that assist homeless people and refugees in the production of soups that are distributed in hospitals and to homeless people. During the period from Monday to Friday the disposal procedure is the same as used at the Coroado Fair, regardless of the type and state of the waste are discarded in garbage trucks.

Despite this, the greatest fragility at the fair refers to fish sellers. There is a portion of the sellers who donate the waste to the feed manufacturers. But not all sellers await the collection of fish waste by manufacturers and end up discarding directly into the river, causing serious environmental impacts on water body banks.

Fig.5: Cleaning process at Panair fair.

https://dx.doi.org/10.22161/ijaers.611.64 ISSN: 2349-6495(P) | 2456-1908(O)

For many years the Banana fair and the Manaus *Moderna* fair occupied the same physical space. But during the technical visits for this study, it was verified that the two fairs had been separated, both in relation to administration, and physically, through the use of wire fences. Despite the physical separation between them, the Banana fair still produces a considerable amount of waste, reaching daily averages around 6 tons.

However, the Banana fair is among the most organized fairs when it comes to waste. Disposals are taken by employees to a waste disposal truck, which was also verified at *Panair*. In addition, a project called "Zero Hunger" is developed, which waste is transformed into meals such as soup, cake, bread, sweet and others. Meals are donated to homeless people, refugees, and or those who need it. But on the other hand, the only downside of the fair is the lack of security of the place that this subject the assaults constantly. This problem was not verified in the other fairs analyzed.

Fig.6: Separation of banana residues at banana fair.

The last fair analyzed was the *Sepror* fair. This fair is one of the most recent as to the period of operation. Therefore, a more modern physical infrastructure and a greater awareness of the environment than in the other fairs analyzed were observed. Nevertheless, as for the disposal of waste generated garbage trucks, which are collected by urban cleaning once a day. Despite having a more modern structure than the others, the waste is not donated, but are reused by the fairs wore themselves. Yes, *Sepror* fair 95% of traders produce their product for sale, and so waste is used from food for their animals.

Fig.7: Disposal of waste from the Sepror fair.

Among the five fairs analyzed, four of them opted for a collection system, to which the fair's employees collect and discard the waste in buckets or trucks collect trucks. For this, each sales stand pays the $5.00 fee for the

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trade fair association, responsible for cleaning and disposal of waste, at an average periodicity of 20 times/day, starting the schedule at 8am until 6pm. It was also observed that employees in addition to being exposed to the sun for a long time, do not use PPE during waste management. Another point observed was the poor state of the instruments used to transport the waste, many of them are adapted. As mentioned above, the *Sepror* fair does not offer these services, the fairs wore themselves are responsible for the disposal of waste generated.

In general, the company responsible for the collection of waste performs the service from 6am to 12:00 pm and 1pm to 6pm, transporting an average of 4 to 10 tons/day. This variation depends on the day of the week, verifying that from Monday to Thursday the average is 6 tons, while from Friday to Sunday the average quantity is 10 tons /day. The final destination is the controlled landfill of Manaus, located at the beginning of the state bus AM-10.

Fig.8: a) form of transport and collection of waste from the pits of the fairs; b) collector containers in each stand.

In addition to technical visits to the analysis of waste logistics, questionnaires were applied in the period of 1 week, to obtain the opinion of the regulars. Among fairs, consumers and waste pickers, a total of 225 people were interviewed at the five fairs, totaling ten questions, where: three questions were aimed at fairs, three to consumers and staff to waste pickers.

The questionnaires show that 70% of traders do not have knowledge about the final destination of waste generated by them. Only 30% of them demonstrate that it would be feasible to implement environmental education practices for fair trades, as shown in Table 1.

The results of the questionnaire applied to the regulars of the five fairs analyzed. It is noted that 80% of consumers are shown to feel bad about the waste of waste generated at the fair. Only 20% of consumers presented waste disposal solutions such as fertilizer, fish feed from waste discarded at fairs. Waste pickers, 90% feel shocked by traders throwing so many products in good quality, every day tons go to the truck, 30% also say they could donate before the waste reaches the trucks.

With the application of the questionnaire, it is clear that there are no investments in EA in free fairs. And also, during the application of the questionnaires, the traders expressed the need to obtain more information on the subject through mini courses on AS, and also the creation of a space for donation waste collectors, and the importance of composting, or make fairs more sustainable.

Table 1: Result of the questionnaire, applied to fairs, consumers and homeless people.

Stallholders	Coroado	Rural Producer	Panair	Banana	SEPROR
Know the destination of waste	70%	80%	45%	80%	10%
Apply EA	30%	20%	55%	20	90%
They are satisfied	8	8	6	8	3
Consumers	Coroado	Rural Producer	Panair	Banana	SEPROR
Concernedaboutfate	70%	90%	60%	80%	10%
They knew the donation system	30%	20%	20%	20%	20%
They are satisfied	3	4	2	3	5
Pickers	*Coroado*	Rural Producer	*Panair*	*Banana*	*SEPROR*
Concernedaboutfate	50%	90%	60%	80%	10%
They knew the donation system	70%	30%	70%	20%	30%
They are satisfied	*2*	*1*	*2*	*1*	*1*

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During the study, the deficiencies and weaknesses of each fair were noticed. And so, it was possible to create a project for the implementation of bucket compost separator at *Sepror* fairs and Coroado fair analyzed. The choice of traders was made according to the type of food marketed, that is, which can be used in the composting process. In addition, at the *Corado* fair the products are brought from all over the state of Amazonas, that is, traders do not produce the products marketed, while at the *Sepror* fair 95% of the products marketed by the fairs.

Although the bucket Compost separator project presented a good acceptance before the fairs wore, there was a fragility at the *Coroado* fair, which was the theft of bucket compost separator during the evening period. Because the opening hours of the fairs wore, they only cover their stands, and the place does not have a security such as fences or gates. Thus, the work of the Compost separator was not completed.

At the same time, although the project is applied only in a stand at the *Sepror* fair, excellent results. After a small explanation and delivery of the explanatory leaflet (Figure 10). The fairs wore showed familiarized to the process of the bucket Compost separator, taking advantage on average that 0.25 tons/day of organic waste per stand that would be destined to the landfill of the city, but if it were applied to more stands would considerably reduce the disposal in the landfill, which today is of the order of 4 ton/day.

Fig.9: a) Installation and production of the sepror fertilizing process; b): Return 20 days after the installation of the Bucket Compost separator, decomposition of waste, and the formation of slurry.

Fig.9: Primer delivered to fairs wore showing the assembly of the portable Compost separator, step by step.

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IV. CONCLUSION

This work shows the results of a study on the five main free fairs in relation to the theme of the disposal of organic waste generated during its operation. The results showed that the analyzed produce a huge organic residue, on average these fairs generate 6 to 10 tons per day. sensitize them about the practices of EA. For, by encouraging by associating the fairs wore, they will feel more encouraged to participate in mini courses, and dynamics of EA.

From the results, a portable Compost separator system for individual use of each fair was developed, called a bucket Compost separator. The compost separator was tested at two fairs showing that: at the *Coroado* fair the project did not have good results due to the theft of the compost separator during the night, time that the fair is not in operation. On the other hand, at *Sepror*'s fair the project had excellent results.

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