

Acceptance of Products Derivatives Açai Kernels by the Metropolitan Region of Belém- Pa for Academic Community

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Abstract: Açai is one of the most consumed foods by the population of Pará, but it generates waste that is not disposed of correctly, which may lead to some socio-environmental impacts. The aim of the present study was to verify the purchase intention of açai seed products by the academic community residing in the metropolitan region of Belém. The research was carried out from May to July 2021 through an electronic form available on the Google Forms platform where the Likert scale was used in the responses, bringing a qualitative and quantitative aspect that presents the following steps: bibliographical research, application of essays and treatment of data using Microsoft Excel® as a tool for descriptive analysis. The female gender was the respondents in most of the ears. In general, most testimonial participants fully agreed that they perceived the irregular disposal of açai seeds as a deposit on the streets. In the perception of the participants, the main social environments caused by the açai seed are visual smoke, the excess of the seed in rainy seasons and the smoke from watercourses. It is concluded that there was a broad and generalized understanding on the part of the academic community about the situation of the inappropriate disposal of açai seeds, the suggested products made from the stone and açai are accepted by the female and male community of the city of Belém.

Keywords: Euterpe Oleracea; Residues Management; Social Environment Impacts; Sustainability.

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Research Paper

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1 INTRODUCTION

In the rich Amazon Forest, the açai tree (*Euterpe oleracea* Mart.) stands out for being the most productive palm tree in this estuary, both in fruits and in genera derived from the plant (MENEZES *et al.*, 2008). The açai is part of huge a paraense population number diet, river peoples in special, that still explore it in an extractive collect form (DA SILVA *et al.*, 2006). By making part of Pará population feeding life, the açai has extreme economic and social importance for the population, especially the poorest.

According to Agência de Defesa Agropecuária do Estado do Pará (Agricultural Defense Agency of the State of Pará) (2017), Pará is the açai bigger national

exporter and holds around 90% of world production, with more than 100 agroindustry, moving around 2 billion of reais and involving more than 300 thousand people throughout its production chain. According to the national supply company (CONAB), outside the Amazon regional circuit, açai started to win the market through work out academies and stores fitness, however, in the last few years, açai won space in fast food chains and supermarkets around the country and world (CONAB, 2019).

Regarding the production of açai, the pollution problematic as a result irregular discard of açai kernels is even more potentiated due to the high consumption and açai wine production in all Pará territory, in special

on the capital state (ADEPARÁ, 2017). Consumption and discard are intimately connected, and they need to be well managed to obtain expression results in fact on the pollution combat

It is from this panorama that the importance and the need to create alternatives for the reuse of these residues arises, in order to reduce the environmental impacts that are generated by this practice. And in addition to creating alternatives, use the existing products potential from the residual açai kernels processing.

It is also necessary to understanding the buying intention and the academic population about the possible benefits, advantages and targets of these products, so that it is possible to have an idea of the real potential that these products can have as a tool to reduce impacts and irregular disposal (Mendes *et al.*, 2020).

Based on the shown problem, the current study has the purpose of identify the buying intention of obtained products through açai kernels reuse by Belém-PA metropolitan region academic community. Assuming as specific goals identify the academic community perception about the environment impacts caused by açai kernels irregular discard; point which products from açai kernels have a bigger acceptance and buying intention; and identify if there are, in the academic community, distinct perceptions between the genders.

2 THEORETICAL BACKGROUND

2.1. Pará state açai Production and Waste Generated By açai Processing

Pará state, with an area of 1.253.164, 5 km², approximately 15% of the Brazilian territory, it stands out on national scenario as the bigger açai producer (*Euterpe oleracea* Mart.) (NOGUEIRA and SANTANA, 2016). According to *Secretaria de Estado de Desenvolvimento Agropecuária e da Pesca* (State Secretariat for Agricultural and Fisheries Development) (2016), Pará owns a more than 188 thousand hectares açai planted area, adding up the managed açai and floodplain (*varzeas*) açai areas.

In Pará state, many cities have a great importance and contributes significantly to the state to be the higher açai producer international. Júnior and Da Silva (2021) affirm that the city emerged to açai production in the 1990 beginnings applying local development theoretical bases supported in involved population active participation, through sustainable management practices of degraded areas. The açai production value presented a fall in Pará in last 5 years of the survey, of almost 71% although had an almost 11% increase in 2019; even so, açai represented a total value of almost 2.9 billion reais Chaves (2019).

The planted area in Para state presents constant increasing, around 65%, that is closely linked at the productive increasing and the demand increasing, both in national and international market. It should be noted that the constant technological and management advances in açai plantations, as well as the launch of new cultivars – as is the BRS Pai D'égua case - contributes directly so that, more and more, the Para state açai producers search new areas to secure bigger profits. Nevertheless, not always the new areas increasing is security of a bigger productivity and production.

In Belém, the production occurs in islands, in floodplain areas, with few or nontechnological equipment, as example, the Combu island. According to results obtained by Ferreira (2020), the açai is the river peoples main income source of Belém islands on harvest season and the management practices adopted by this population are grubbing, bush thin out, thinning, planting and harvest; adubation and draining practice are not used.

Mendes *et al.*, (2020) pointed that business administration has big role on market analysis strategical planning that aims to carry out residue usage produced in economic activities, as the açai “beaters” (açai processors) case; thus, what before was discarded by lack of utility, today can be used, avoiding accumulation on environment and promoting by this manner a sustainable politic.

Other important factor in all residue's problematics, is the collection of these residues, either by the government or by the açai beaters themselves. Negrão *et al.*, (2019) detected that good part of açai saling establishments throw out the own residues through carters that end up throwing it in inappropriate locals like vacant lots and own neighborhood streets shoulders, what increases the negative impacts produced by these establishments that do not comply the own responsibilities around the generated residue.

However, it is important to point out that the residues from the açai processing are not the only ones responsible for public pollution.

2.2. Social Environment Problems Caused By Irregular Discard

Mucelin and Bellini (2008) described that among the negative impacts to environment that can be originated from urban garbage are the effects caused by practice of residues irregular disposition on vales, streets shoulders or waterways; these practices can cause water bodies contamination, silting, floods, proliferation of disease-transmitting vectors (such as mice, cockroaches, flies, worms), besides visual pollution, bad smelling and environment contamination.

One of the main worries around the irregular açai kernels discard is about the medium-term effects of contribution to public routes floods in rainy seasons. With the constant accumulation of this material in routes, sidewalks, vacant lots, streams, channels, among others, the water drainage power of public routes is strongly prejudiced, causing constant disturbances mainly in the lower areas of the metropolitan region of Belém (ADEPARÁ, 2017)

Teobaldo and Pereira (2018), affirm that due the Belém geographic location, the capital has lowered

areas and floodplains, where predominates the uncommitted creeks, that received the name of channels.

Thus, being the channels one of the points of irregular garbage discard, there is uncountable social and environmental consequences to population that resides next to these channels. The storage of this organic material in these channels serves also to let water stopped culminating on proliferation of diseases vectors as dengue (MARTINS and SPINK, 2020).



Figure 1: Flooded route after rain in Belém
Source: Roma News (2019)

Dos Santos Lima *et al.*, (2019) pointed that in Belém, diseases transmitted by *Aedes aegypti* mosquito (dengue, yellow fever, Chikungunya and Zika virus) are strongly connected to unhealthy environment, as much relation to sanitary sewage as issues related to solid residues management, such as the residues from açai fruit processing, for example.

A relevant disease in inappropriate açai kernels discard context is the leptospirosis, that was described by Martins and Spink (2020), as a bacteriosis pathogenesis poorly understood, which its transmission in humans occurs of an accidental form by contact to urine of contaminated animals..

The visual pollution is described by Leite (2020) like excess of urban degradation that causes any

stress kind in environment that affects the human being life quality. Codato (2014), however, argues that visual pollution must not be understood only as part of environment degradation. Moreover, the constant açai pulp production increasing inevitably results in it kernels dump in public routes. Despite Gonçalves & Da Silva (2016) pointed that organic garbage generally is discarded in plastic bags and sent to collection services or composting, this is not the actual reality in Belém metropolitan region.

In the same way that visual pollution is present in this context, the sidewalks obstruction due the açai kernels is also a common panorama in Belém metropolitan region. This obstruction obligates pedestrians to walk by the streets enhancing accidents risks.



Figure 2: Big plastic bags with açai kernels obstructing the sidewalk
Source: O Liberal (2019)

2.3. Açai kernels reuse forms

In the last years, much research was started to discover new açai kernels kinds of use, and among these studies, the search for the fruit kernels fibers on furniture obtaining are gaining prominence. Barbosa *et al.*, (2019) discovered that açai residues have potential to be used in constructions.

Corrêa *et al.*, (2019) analyzed that the products originated from agroindustry, among then, the açai one, produces along its productive chain a certain quantity of organic residues that entail in several environment pendency arising of accumulation and discard in inappropriate locals, however, this quantity of generated subproducts present a great potential to be explored. The solids and organics residues reuse results in products with commercial demand, that do not contaminate the environment and are advantageous, once solve part of residues management problem, in economic, social and mostly sanitary levels (SILVA *et al.*, 2020).

Mendes *et al.*, (2020) consider that the residues producers need to assume the responsibility with environment, with efficient alternatives use of these residues in an advantageous way and with sustainable and lucrative finality; that way, it would avoid some environment damages in addition to generates jobs and income to company and residents.

Among the many advantages using compost made with açai kernels, according to Teixeira *et al.*, (2005), it has the agricultural reuse of organic material produced by the state, the nutrients recycling (in all organic adubation obtaining process), the pathogens elimination, an environmentally safe product supply, as well as avoiding atmospheric pollution and incomes generation through this fertilizer usage or sale.

Silva (2018) concluded in studies that açai kernels contributes to a cleaner and healthier environment possibility from this organic material usage replacing wood on bricks production process, enabling many residues reduction, reusing and recycling, declining the quantity to be discard in open sewage or next to water supplies.

According to FABRO (2019), to creates the açai brick, it was invited Moju young people to help her; they put açai kernels to dry, after charred and smashed with a pestle. The resultant mass was mixed with clay and coal to end up at final product.

Other açai kernels utilization form is as substitution to coffee, a large consumed beverage in Brasil. The açai kernels beverage, as cited by Costa *et al.*, (2020) has the finality attends a market which people for some reason cannot ingest caffeine or people who wants to decrease the amount of caffeine ingested, since coffee stimulates the nervous center, causing

insomnia, malaise and other. Further Costa *et al.*, (2020) the açai kernels beverage holds the same color, taste and aroma characteristics of traditional coffee.

The açai seeds in beverage based on coffee use is an alternative to necessary costs reduction to disposition and treatment of these residues, reduction on environmental impact caused by elevated volume of generates residues and to value aggregation at açai agroindustry residue (FERNANDES *et al.*, 2011).

3 MATERIAL AND METHODS

3.1. Methodological procedures

This study was realized through a questionnaire application in remote format due the Covid-19 pandemic, using *Google Forms* platform and embraced academic community people that resides on Belém-Pará metropolitan region (BMR). The form kept available to fulfilling between May and July 2021. The questionnaire is a research project construct, that for this present wok was not analyzed all questions, being able to be use in future research.

The target audience was Belém and close cities higher education students and professors, it being açai consumers or not, for this, because are people active in the area of education knowledgeable about the waste reuse process reducing environmental impacts

The gender was chosen as variable to analysis around socioenvironmental questions and buying intention to verify possible distortion motivated by these factors into answers, as well as verify a possible gender predominance over other in determinate question or perception.

The study was divided in quantitative character on opinion questions and Likert scale use, and in qualitative character with multiple choices questions. According Manzato (2012), the quantitative research methods are used, in general, when it wants to measure opinion, reactions etc. of a target audience through a sample that represent its, which may have also qualitative indicators, if the study allows it.

That way, the present study has exploratory character, with bibliographical research in terms of açai importance in paraense economy, beyond generated residues by its production chain; and with the questionnaire application was possible comprehends different perceptions about the proposed theme.

The questionnaire application was used the Likert scale (SILVEIRA *et al.*, 2010), to, wishes to measure the participant concordance level or not to the affirmation, where usually are used five answers levels, being a bipolar scale, since it can receive an answer either positive or negative. By these means, the Likert scale allows to understand the participant real

perception about the proposed theme.

To the current study, the five answers levels used as: I totally disagree; I disagree in parts; I neither agree neither disagree; I agree in parts; I totally agree.

3.2. Data collection Instrument

The participants answered a total on 13 items divided in demographic and opinion questions. To demographic data collection was used questions as age, gender, race and familiar income, to portray the participants profile beyond that, the participants had to indicate their education level (Gouveia *et al.*, 2009).

To opinion questions, affirmatives were given to participants to indicates your concordance level or not to them. For it, was used a five point's answers scale which are: I totally disagree; I disagree in parts; I neither agree neither disagree; I agree in part; I totally agree.

These affirmatives are important to understand about respondents: opinions on residues discard frequency; if this discard generates negatives impacts or not; if this material reusing can be a negative impact decreasing form; if there is knowledge about reuse of açai kernels; and if there is açai exclusive buying intention in locals that reuse the generated residue.

To questions about what is considered as social environmental impact and what products could be bought by the participants, were given the option to choose more than one answer, in case the participants considered more than one option correct, what it could make difficult in understanding in which products could have more acceptance and which impacts are more

considered if it was given only one option.

3.3. Data analysis

For data treatment obtained with qualitative and quantitative questions forms was used the *Microsoft Office Excel* to descriptive statistical analysis which has as main goal outline values in tools and techniques as tables, graphs, variability measures and global trend (Mancuso *et al.*, 2019). To results graphs esthetical standard was used Online *Charts* website.

4 RESULTS AND DISCUSSION

A total of 257 people that matches to academic to the academic community answered the available questionnaire. Thus, it was considered only respondents with an incomplete college education level, complete college education and pos-graduation level. The feminine gender is compatible with *Censo da Educação Superior de 2017* (2017 College Education Census), which demonstrate that women are 57% of enrolled and 61% of students who concluded a graduation course in country. This manner, the feminine majority among questionnaire participants were agreeing with the expected.

To understand the frequency in which the respondents see açai kernels irregularly discarded in public routes was made the sentence "I often see irregular discarded açai kernels on public routes". For this, was used the five points Likert scale, with options: I totally agree (TA), I agree in parts (AP), "I neither agree neither disagree (NA/ND), I disagree in parts (DP), I totally disagree (TD). Each person was able to choose just one alternative, that way, the answers total number were 257, the percentual can be identified on figure 3.

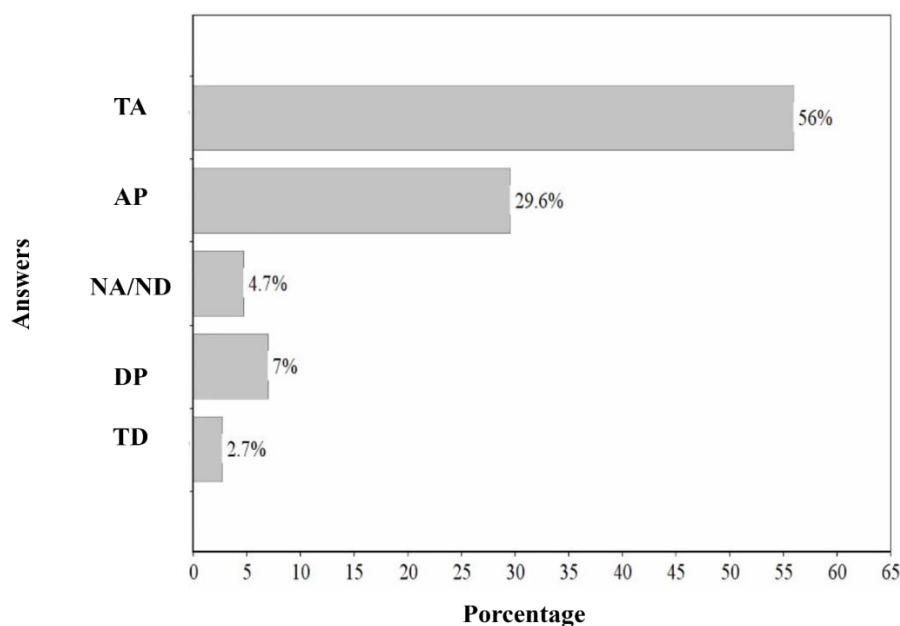


Figure 3: Respondents' view about açai kernels irregular disposal in public routes perception

Source: Authors (2021)

The people who agree with the affirmative percentage was extremely significant, with 85,6% of answers, if adding TA and AP answers. Almost 4,7 % people was neutral and others 9,7% disagreed.

In the question about what respondents consider as social environment impacts, directly caused by açai kernels irregular discard, more than one impact was available to be chosen. That way, the total answers

number was 1.109, in which was percept a large equilibrium among the five more chose options.

The available options were: Visual pollution (VP), Water channel pollution (CP), Disease proliferation (DP), floods in rainy seasons (FRS), public walk obstruction (PWO), public spend increasing (PSI) and none of these alternatives.

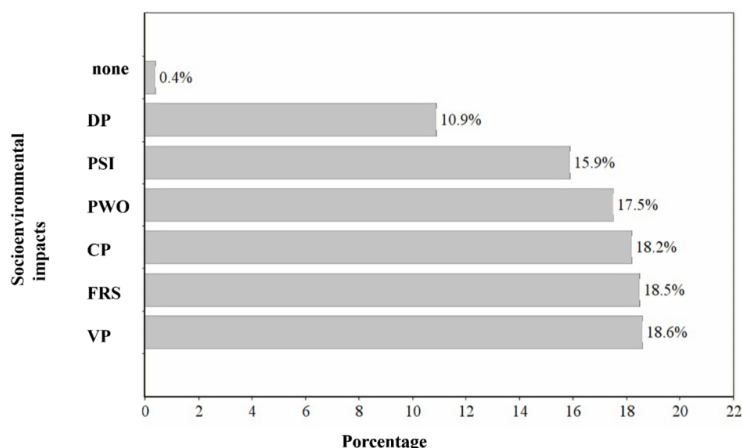


Figure 4: Answers about social environment impacts caused by açai kernel discard

Authors (2021)

Visual pollution (VP) was the main impact pointed by academic community with 18,6% answers, with minimum difference to floods in rainy seasons (FRS) and Water Channel (CP), with 18,5% and 18,2% of answers, respectively. Such fact can be explained by facility in see itself and associates the açai kernels directly to these impacts once this residue is easily found in Belém Metropolitan Region streets and water channels. According to *Secretaria de Estado de Desenvolvimento Econômico, Mineração e Energia (SEDEME)* (State Secretary of Economic, Mineration and Energy Development) (2021), in 2017 there were Around 10 thousand açai selling points each one producing daily an average 200 kilos residue.

Floods are present such a long time in Belem metropolitan region population life, that, with lack of maintenance and cleaning of water channels, pipes, drains, routes and others, tend to increase year after year.

The visual and water channels pollution is directly connected to other social environment impacts that were also options on used questionnaire, as floods in rainy seasons, diseases proliferation, public walk obstruction and public spends increasing with urban cleaning. Although a difference not so much significative, the diseases proliferation (DP) was the option with less answer's percentage among the mentioned impacts.

This number a little bit low to others impacts, with 10,9% choices, can be explained just for being the

most indirect impact and more difficult to be related to irregular açai kernels discard, once in Amazon region, there is disease proliferation by many reasons an even by weather and humidity region characteristics. Nonetheless, it was waited a bigger and equivalent percentage to others impacts, as diseases like dengue, that is so present in paraense daily, is potentialized precisely by garbage accumulation on streets and water channels, what makes possible vector dissemination by stop water (MARTINS and SPINK, 2020).

Just below water channels pollution, it was public Walk obstruction (PWO)- with 17,5%. This damage is easily perceptive too, what explain the high number of choices. The PWO by açai kernels also is easily observed in Belém and near cities. Mountains of açai kernels are formed all through many neighborhoods, mainly near to manipulation and açai wine sales locals.

In fifth place among the chosen answers, the public spends with urban cleaning (IPS) obtained 15,9% of votes. Although being a little bit under of others four answers more chosen, still is an expressive number and near of more mentioned. IPS is a consequence that is not too visual connected to irregular açai kernels discard problem, the public power duty is ensure satisfactory population life quality, in this aspect is also included the urban cleaning being possible to reduce all others impacts mentioned on the questionnaire of this research, however, is important also emphasize that population needs be inserted in this process.

In this context, the population – mainly the açai “beaters” – need to act with the correct discard of this material and on denouncing of it. As expected, a very low number of answers – totaling 0,4% - was destined to option to no one of impacts mentioned are occasioned by irregular discard of açai kernels.

In the question about which products obtained

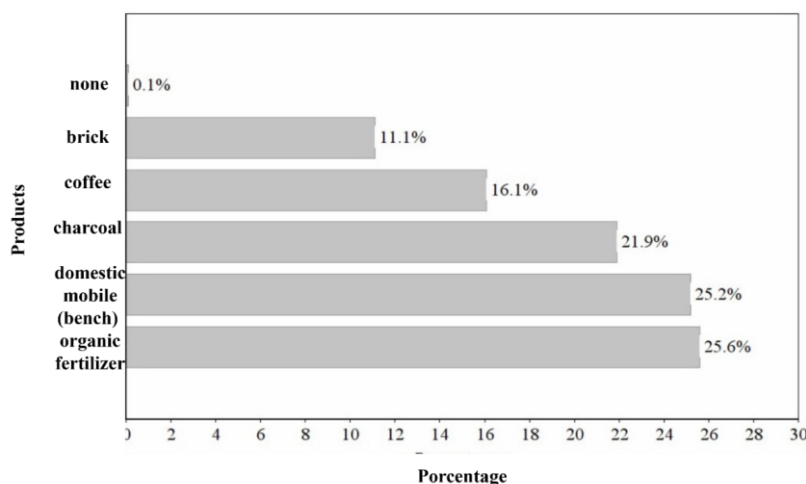


Figure 5: Products from açai kernels buying intention

Source: Authors (2021)

Among the five products suggested options to participants, three of them obtained a higher expression on answers, as shown of figure 5, that are organic fertilizer, the domestic stool and vegetal coal. The organic fertilizer and domestic stool seat were the most voted, respectively, with 0,4% difference, totaling more than half answers.

As expected, the organic fertilizer was the most chosen, mainly for be the most usual and known manner of organic residues reuse by population, in specific, the açai kernels. Is important to emphasize too, that part of answers is of students, professor and Amazônia Rural Federal University egresses, that owns a profile directed to agrarian sciences, consequently a familiarity with this problematic.

Açai kernels utilization as fertilizer, chosen by 25,6% answers, is a reuse and decreasing organic inappropriate discard locals' important tool. The modern agriculture prioritizes the resources potentiation to leverage economic gains. From small to big producers, the resources reuse generated on won production is extremely important in social environment aspect, acting in incomes generation, economic and environment. (Moreira *et. al.*, 2020)

The domestic stool, bench seat was the second most chosen option, with 25,2% answers. This expressive number it was gave by acceptance facility of wood products from organic residues reuse, also powered by participants knowledge level about the

by açai kernels reuse the participants could buy, it was possibility to choose more than one option. This manner, the answers total number was 792, which it was percept an equilibrium among the most usual forms of açai kernels reuse. The available option was organic fertilizer, domestic stool seat, açai coffee, brick and any product.

subject. In addition, a domestic mobile, as bench seat, tends to obtain a high acceptance by its convenience and for being indispensable item and most residences that can be used with a lot of finalities. For it be a product with raw material from organic residues discard, can be considered as a good cost-benefit, with reduced price and acceptable useful life.

From the domestic point of view, the vegetal coal can be used as filter to water impurities cleaner that can be drink or used to foods washing and food preparing. The Belem Metropolitan Region has basic sanitary severe problems, and the potable water is a “luxury item” to many people. Thus, the vegetal coal may have a super important role in social context, once it could help combat inequalities, decrease infection number by food and water, beyond, for sure, obtaining an important destination to açai kernels. (Pereira and Rodrigues Júnior, 2013)

Further below the three most chosen products, it is açai coffee, that obtained 16,1% respondents answers. Is a considerable high value, considering that açai coffee is a relativity new product, that can aggregate more value to açai chain production, with subproducts diversification, then, an even bigger public and market can be attained to the main Amazon region fruit. For being a product not so know for now, açai coffee cannot becoming in fact a product with high acceptance, but it shows the scientific research importance in experiments conduction to new functionalities discover and possibilities to açai fruit

The product that obtained the lower buying intention acceptance was brick obtained through açai kernels. As expected, the brick presented low answers number, adding only 11,1% answers. Innovative products that aggregate materials before thoughtless as its raw material tends to be seen with bigger distrust in relation to products more known and experimented. Although respondents' profile, brick shows itself a product with low acceptance.

not buy any mentioned products, resulting in only 0,1 % answers, consequently, becoming negligible, as expected. The percentual comparison between the male and female genders was analyzed to percept possible differences and causes among answers about social economic impacts caused by irregular discard and buying intention of products obtained from açai kernels. The comparison also gives among the total percentual of males and females respondents in all questionnaires, where around 63% are female sex and 37% are male sex. The results are shown on figures 6 and 7.

Lastly, only one person answered that would

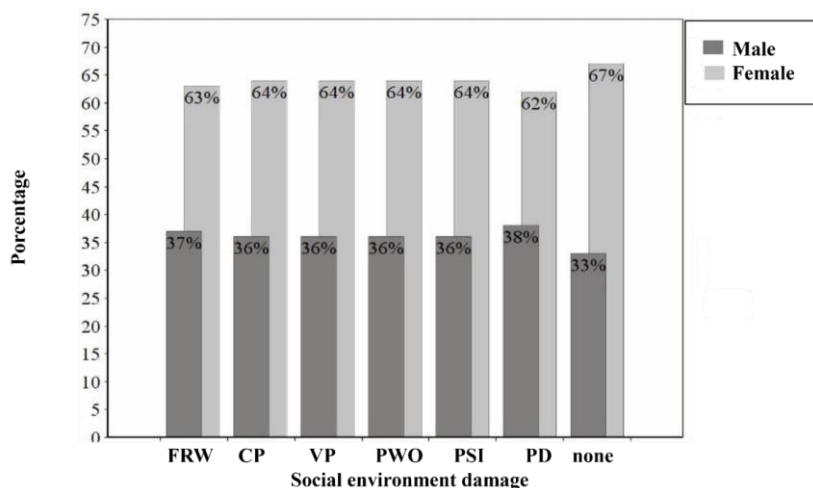


Figure 6: Distribution between genders of answers around the social environment damage
 Source: Authors (2021)

In relation to socioenvironmental impacts, there was not significative difference among male and female genders answers with the percentage of participants genders. The option “Nothing” had a little

difference in relation to other answers, but no significative. This manner, there was not distinct perception between genders.

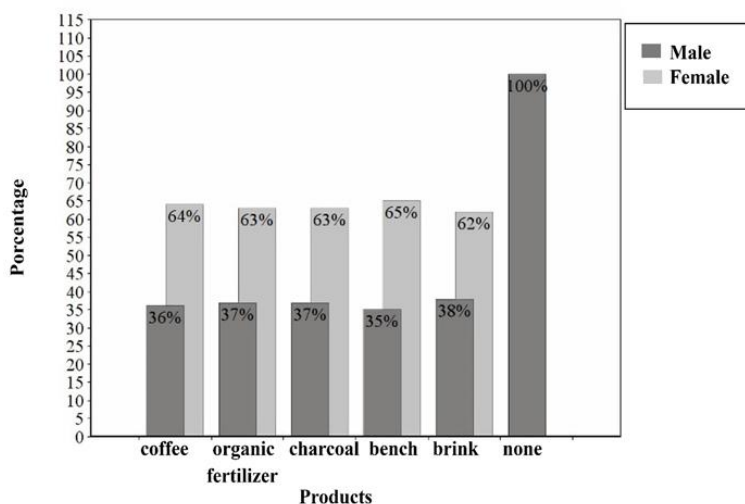


Figure 7: Distribution among genders answers to products buying intention
 Source: Authors (2021)

On buying intention products, it is worth mentioning that “none” option only had one single answer, from male gender, what explains the 100% percentage. However, in other options, at

socioenvironmental impacts question example, there was not significative difference among answers by gender, what characterizes that there was not distinct perception between genders.

5 CONCLUSIONS

From the questions answers selected to this study, it could understand that there is a broad and general knowledge inside Belem metropolitan region academic community about social and environmental problems that açai kernels irregular discard can cause. It was also possible percept that açai organic garbage is present in a recurrent manner in biggest part of academic community daily, showing that the garbage problematic is far away to be solved.

Among the açai kernels sustainable reuse possibilities, there is a good acceptance of main products mentioned in this research, there is bigger acceptance for products that is already known by people part, as fertilizer, vegetal coal and kernel use to domestics' mobiles construction; but it is still possible to perceive a certain resistance in products relatively new, as açai coffee and brick, even by academic community

Products from açai kernels present themselves as an extreme potential alternative and importance not only to decrease of impacts caused by this residue to environment, but also in jobs and incomes generation, it is worth reminding the social-economic importance of all this productive chain participants agent.

Inside academic community there was no difference on perception between genders about subjective questions present in the questionnaire as previously expected, considering that inside academic environment supposedly both have same theoretical basis.

It is important emphasizes that results from this work about açai urban garbage problematic cannot be generalized for all resident population on BMR, once in college education institutes there is recurrent debates and research about irregular garbage discard, being it organic or not.

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