

GRASSROOTS ORGANIZATIONS;
A POTENTIAL SOLUTION TO NATURES COMPLEX GIFT

*Insight into the Influence of the Intensification of Açaí on the Agroecosystem
Resilience of Communities in Curralinho, Pará, Brazil*



Grassroots Organizations; A Potential Solution to Natures Complex Gift

Insight into the Influence of the Intensification of Açaí on the Agroecosystem Resilience of
Communities in Curralinho, Pará, Brazil

Master Thesis: International Development Studies
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Acknowledgments

After months of preliminary work, and six months of data collection & analysis, I am happy to present you with my thesis on the influence of the intensification of açai on the agroecosystem resilience of communities in Curralinho, Pará, Brazil. The research is part of the graduation assignment of the International Development Studies Master's Degree Program at Utrecht University. This research took part in collaboration with CIFOR, the Center for International Forestry Research.

In order to understand the influence that the intensification of açai is having on the agroecosystem resilience of communities in Curralinho, Pará, Brazil, three questions exist. Foremost, it is necessary to understand how the intensification of açai influenced the development of organizational processes. Second, there is a need to review the organizational processes against current literature. Lastly, an assessment of the influence a grassroots organization is having on agroecosystem resilience of one community can provide insight into the agroecosystem resilience of both types of communities in this region.

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Thank you,
Tyler Sanderson



Executive Summary

In three decades, açai moved from providing sustenance for rural communities to an international superfood. Meanwhile, the timber industry was facing regulatory pressure and resource depletion. This pressure caused a need for communities to shift their focus to a new trade. Fortunately, açai provided a nearly equivalent source of income for the local communities because of its high-profit potential. However, the intensification of açai also exacerbated & created new vulnerabilities; mitigating the benefits associated with this demanded superfood. Still, many have turned to the açai trade because of the need to replace income once made from the timber trade. Therefore, understanding the impact of this increased focus on açai is necessary.

One of the most common methods to study the vulnerabilities of communities is through an assessment of agroecosystem resilience. Furthermore, before this study, there has not been published work on the influence of the intensification of açai on the agroecosystem resilience of açai harvesting communities. Therefore, this work seeks to move research forward in this manner. Additionally, within most açai harvesting regions there is a difference in communities; some work directly with an organization and others work independently. One type of organization that has received little focus is grassroots organizations. For this reason, the research sought two communities, one with the influence of a grassroots organization and one that does not. This thesis will provide a comprehensive view of the overall impact that the intensification of açai has on the agroecosystem resilience of açai harvesting communities.

For a comprehensive view, a multiple-case study methodology is appropriate. The first community was Comunidade São Jorge, who work independently in this trade. The second community is called Coração de Jesus, which is actively participating with Sementes do Marajó, a grassroots organization. These communities are different in this aspect, but they are similar in population size, distance from the nearest city & port, and because of the percentage of individuals involved in açai harvesting & sale. This research sought to understand how the intensification of açai influenced the development of organizational processes, how these processes reflect against previous literature, and it assessed the impact of Sementes do Marajó on agroecosystem resilience. Through the analysis of previous research, observation of the communities, forty in-depth interviews, four gender-based focus groups, and seventy-three agricultural surveys in the communities, these questions were answered. In congruence with these answers, one focus group and eleven relevant actors brought forth necessary background information.

Overall, this research determined that the agroecosystem resilience of communities in Curralinho is based on the presence of Sementes do Marajó or not. Sementes do Marajó had a positive influence in reducing or removing six vulnerabilities that would have existed otherwise. The vulnerabilities that are positively influenced by Sementes do Marajó are, *Social Events within Communities*, *Sell to Multiple Types of Buyers*, *Sell to a Local Market*, *Earn a Livable Wage*, *Connection between Universities, Researchers & Farmers*, and *Understanding the Limits of Production*. Second, Sementes do Marajó was found to have a negative influence on one vulnerability; *Reliance on Government Assistance*. Third, Sementes do Marajó has a varied influence on the sub-indicators of *Decision-Making Autonomy* and *Multiple Income Sources*. The community that did not work with Sementes do Marajó was found to be facing more overall vulnerabilities today. Theoretically, by choosing to not work with Sementes do Marajó, these communities are at more risk if an external threat reaches their community.



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List of Abbreviations

<i>Abbreviation</i>	<i>Phrase</i>
FAO	Food and Agriculture Organization
NTFP	Non-Timber Forest Product
UN	United Nations
SDM	Sementes do Marajó
SHARP	Self-Evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists
PAR	Participatory Action Research
IBGE	Instituto Brasileiro de Geografia e Estatística
VP	Vice President
ABAC	Associação dos Batedores de de Curralinho
SRS	Simple Random Sampling
FGMCDJ	Focus Group of Men in Coração de Jesus
FGWCDJ	Focus Group of Women in Coração de Jesus
FGMSJ	Focus Group of Men in <i>Comunidade São Jorge</i>
FGWSJ	Focus Group of Women in <i>Comunidade São Jorge</i>
GRO	Grassroots Organization



Chapter 1: Introduction

Milo, an eight-year-old boy whose height is just below 120 cm, wraps palm leaves over each other until a green, oval-shaped ring appeared. This ring, twice the size of his waist, rests in his hands. He steps inside the ring and jumps onto the slick tree surface. He grasps his hands around the other side of the tree as the ring, now at his ankles, produces grip at his feet. He swiftly climbs up the tree, to the peak that firmly stands nearly ten times as high as the uppermost tip of his hair. He breaks off two large bushels of fruit and slides back down the tree before the onlooking eyes complete a blink. The fruit itself, açai (*Euterpe oleracea*), is pressed for its juices in a small cylinder since eating it as a fruit only yields a minimal amount to consume.

For centuries, this fruit was eaten locally as a daily part of the diet. However, in the last forty years, the combination of urban sprawl and migration brought a rise of the once rural families to the cities. Due to their already developed love of açai, the fruit followed the people. In the North of Brazil, it is consumed most commonly as a side dish, in a bowl, with roasted tapioca or cassava flour mixed inside. Throughout the country, it is mixed into ice cream or made into a drink to enjoy the fruit in different ways (Cordeiro de Santana, et al., 2017).

In the early 2000's, açai started moving to other parts of the world. Brondizio et al. (2002), explain that açai went from *rural staple food* to an *international fashion food*. The main reason for this is due to the nutritional knowledge researchers have learned about this fruit and the marketing of its high density of nutrients; earning the categorization of a superfood.¹ Wolfe (2009) states that superfoods are not merely food, nor are they medicine; they are in a grey area of being enjoyable and healthy at the same time.

Nonetheless, there has been a global rise in the demand for these foods, as the public becomes more aware of the array of dietary choices available in this world. The Mintel Global Market Research Group (2016) claim that from 2011 to 2015, there was a 202% global increase in the presence of the terms superfood, superfruit, and supergrain found on advertisement packages. The açai berry has been one of the many superfoods that have benefited from the market itself. This round, dark-purple berry that shares a similar shape and size to a blueberry, is known for being able to provide energy, help fight the common cold & influenza, and its ability to reduce the chance of attaining cancer through its high level of antioxidants, insoluble fiber, and protein (Alqurashi, et al., 2016).

1.1 A Change in Supply

For everyone to have accessibility to the açai berry, there must be an increased supply of the fruit. Generally, when a Non-Timber Forest Product (NTFP)² is in high demand, three different extraction/farming alterations can be made; depending on a variety of factors. Either the community can increase the amount of the NTFP they are harvesting, an increase in cultivation can occur, or a mixture of

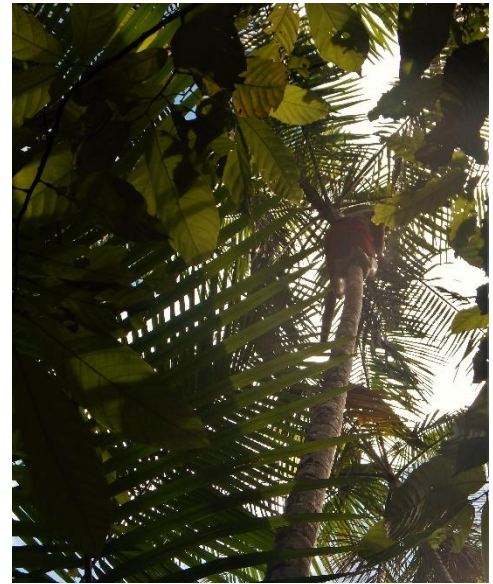


Image A) Açai Harvesting

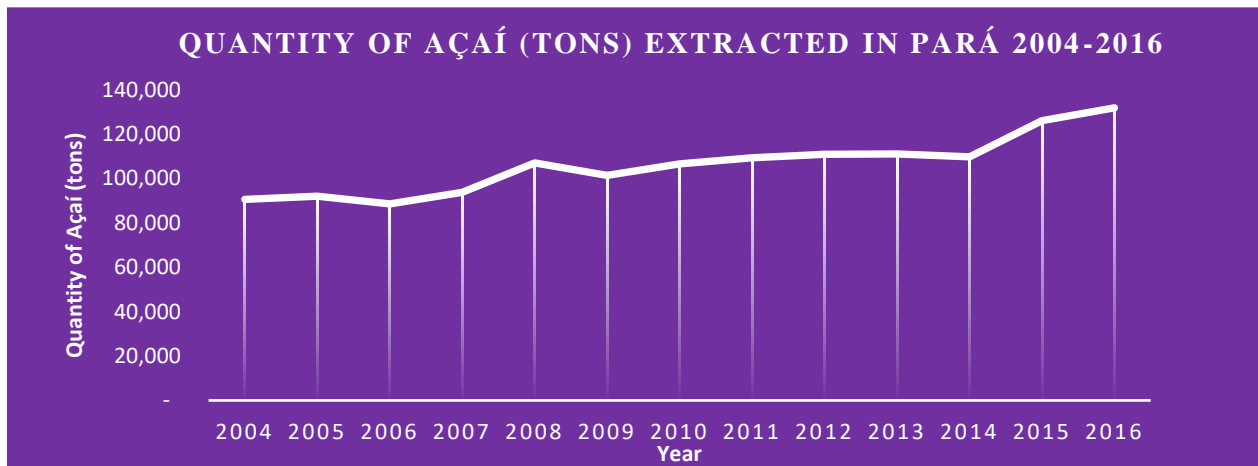
¹ foods that contain a multitude of necessary and diverse nutrients for humans (Wolfe, 2009)

² Seeds, flowers, fruits, leaves, roots, bark, fungi, etc. that are found in the natural environment and have some value (Ticktin, 2004)

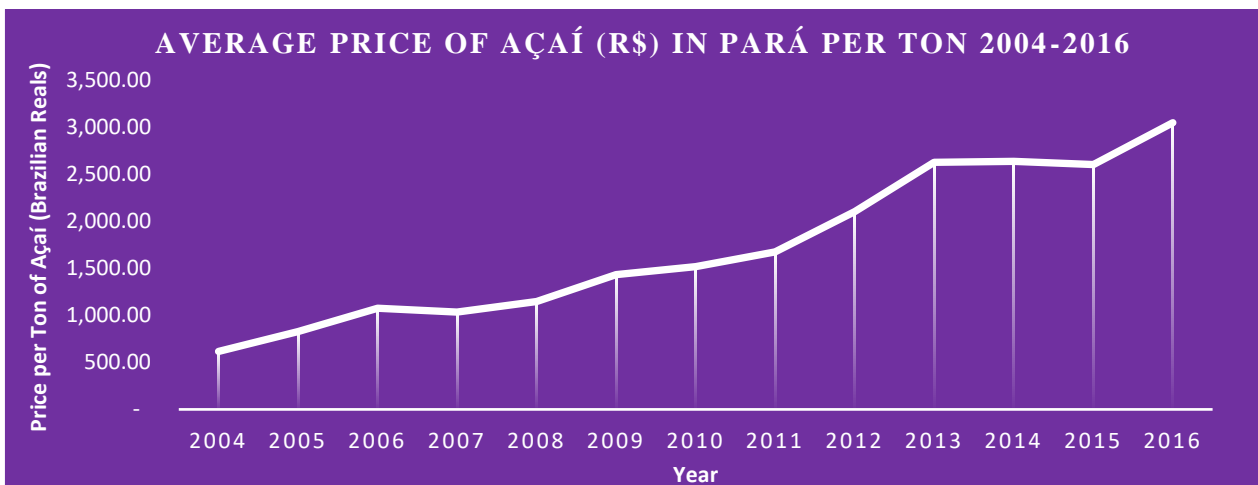
both can satisfy demand (Alam & Belt, 2009). In the case of açai harvesters³ in the State of Pará, the largest state supplier of açai in Brazil, there is a mixture of both intensification⁴ methods taking place.

Through observing *Graph A*, the gradual increase in supply appears. It displays that from 2004 to 2016, there has been a 45.66% increase in the supply of this fruit in Pará. This increase represents a movement from approximately 90,512 tons of açai in 2004 to 131,836 tons in 2016 (Instituto Brasileiro de Geografia e Estatística, 2018). In this same timeframe, *Graph B* shows that there has been an increase in the price of açai in Pará. In 2004, the average price of one ton of açai was \$616.40 Brazilian Reals. In 2016, this price rose to \$3,048.29 Brazilian Reals. This movement represents a 394.53% increase, averaging a 163.34% increase per year (Instituto Brasileiro de Geografia e Estatística, 2018).

Graph A) Quantity of Açai (tons) Extracted in Pará, Brazil from 2004-2016 (Instituto Brasileiro de Geografia e Estatística, 2018)



Graph B) Average Price of Açai (R\$) in Pará per Ton 2004-2016 (Instituto Brasileiro de Geografia e Estatística, 2018)



³ both the community members that are harvesting the natural açai and those that are increasing the number of açai trees to harvest at a higher rate

⁴ the increased focus on a crop that results in either the amount of harvesting or cultivation to rise (Alam & Belt, 2009).



1.2 The Problem

The increase of supply and the price of açai only tells a small part of the situation in the Amazonia region of Brazil. The global demand exacerbates an issue that already existed for communities. Before the increased demand, many of the açai harvesting families could not bring açai to the market to connect directly with buyers (Brondizo et al., 2002). As the global demand formed, the distance that açai needs to travel and access to the buyers of açai has become even more daunting. (Pegler, 2015). These changes result in those that once had some control over the sale of their product to rely on others. This reliance comes from the value chain⁵ expanding. In more detail, Pegler (2015) states “many end up providing products to a well-organised chain of buyers, logistical processes, ports, manufacturers and brands stretching all the way to consumers in the Global North.”

Açai is sold directly from the house of açai harvesters to *atravessadores*,⁶ which will result in either the product entering the local market or more commonly, it will enter the extended value chain discussed above. Pegler (2015) explains that “...small-scale producers are often denied voice and security when included in chains.” The terminology for this type of voice is decision-making autonomy. According to Rotz & Fraser (2015), “...decision-making autonomy is defined as the degree of control that producers have on production as well as their ability to observe and respond to feedback mechanisms.” Within this context, decision-making autonomy for açai harvesters is the ability to make choices that are relevant to the harvesting, transportation, and sale of açai. Overall, the lack of voice described above means the decision-making autonomy of açai harvesters is compromised.

This lack of choice is an issue because many families within communities across the region have a need to be involved with the intensification of açai due to restrictions on the timber-trade and access to land (Shanley & Swingland, 2002; Deere, 2003; Sauer & Leite, 2011; Pegler, 2015). The restriction on access to land is also related to another vulnerability of açai; the limitation of maximizing yield.⁷ If this was not enough, açai harvesters are also facing issues surrounding the fragility & seasonality of açai (Brondizo et al., 2002; Lewis, 2008; Cordeiro de Santana et al., 2015; Pegler, 2015). However, as said before, many need to be involved with the intensification of açai because açai has high-profit potential.

This need leads to some communities connecting directly with outside organizations to help stabilize the vulnerabilities that exist. The literature explains that the presence of an organization or business has mixed results regarding forest products, but many times they can successfully mitigate the vulnerability of the fragility & seasonality of açai. Conversely, the vulnerabilities of the limitation of maximizing the yield of açai and decision-making autonomy are usually not influenced (Morsello, 2006; Pegler, 2015). However, the presence of an organization does not necessarily need to come from an outside entity. Grassroots Organizations (GROs) exist in communities; however, little literature exists on them.

Previous research has also never looked at how these GROs form within these communities and how they develop organizational processes amid the new and exacerbated vulnerabilities that exist across this region. Additionally, the previous research that does exist around the presence of organizations does not compare the influence of the outside organizations against a similar community in the area. A lack of comparison can lead to questions over the claims; as it is difficult to understand the context when only information about one community exists.

⁵ the full process a product goes through, which includes various steps that increase the value of the product along the way (Investopedia, 2018)

⁶ transporters of açai

⁷ the total amount of a produced crop



1.3 The Purpose of this Study

The purpose of this study is to develop an understanding of how the intensification of açai influenced the agroecosystem resilience of communities in Currealinho, Pará, Brazil. Primarily, it is essential to understand that not every community is the same. In Currealinho, some communities work alongside GROs and others do not. Secondly, it was essential to understand how the intensification of açai influenced the development of organizational processes, how these processes reflect against the literature, and the influence a GRO is having on the agroecosystem resilience of communities compared to those that continue to work without external help. The overall goal is to move the current research forward and to provide new insight into what the intensification of açai means for communities. This thesis will first explain the previous literature & provide a conceptual framework to be used, will explain the methodology & results discovered, and then provide a discussion of the results. Finally, a conclusion to the central research question will arise.

Chapter 2: Literature Review

To be able to accomplish the purpose of this research, there is a need to review the previous literature in three different categories. First, it is necessary to understand what the intensification of any crop and eventually what the intensification of açai means in this context. Second, a more direct focus on agroecosystem resilience will take place because it is the most accepted method for evaluating vulnerabilities. Lastly, it is vital to understand GROs more thoroughly. At the end of this section, the findings of all three sections will be bridged and the research gap will be explained.

2.1 Crop Intensification

Crop intensification revolves around two significant aspects. The need or a desire for an increased focus on a crop and the implementation of a procedure to increase the agricultural yield based on the number of inputs. These inputs can include but are not limited to labor, seeds, money, and land availability (Cassman & Pingali, 1995). In most cases, the need to increase the production of a crop is due to an increased population (FAO Office of Director-General, 2018). For example, during WWII there was not only an increase in the population within the United States, but the military was seeking high amounts of food due to the intensity of the work experienced by soldiers. To reach this demand, the U.S. resorted to subsidizing the large-scale production of corn to raise the yield to the desired need (Pollan, 2006). Similarly, in Asia during the 1960's, the increased demand of rice due to population growth resulted into seed innovations that reduced crop growth time to get more production out of a single piece of land (Cassman & Pingali, 1995). Concisely, crop intensification focuses on trying to maximize the number of crops produced while also trying to reduce the number of resources needed in the process to fulfill a need or desire. The next section will look more in depth at the cause and feasibility of the intensification of açai in Brazil.

2.1.1 Açai Intensification

Population growth is not the only change that can lead to the intensification of a crop. As previously discussed, the highly desired superfood traits of the açai berry influenced demand and the high-profit possibilities for suppliers has led to an increased desire to grow and harvest more of this crop. Pegler (2015) explains that these profits are so high that they could replace the long-standing wish to take place in the timber-trade since açai is generating profits like that of lumber. A shift in focus could be remarkable because in the 1980's & 1990's many communities were taking part in the timber trade; this subsequently changed the forest landscapes in Brazil and led to significant land use restrictions to protect the remaining forested lands (Shanley & Swingland, 2002). These land-use restrictions and the low-profits associated



with other crops resulted in the need for many within the communities to move towards the intensification of açai (Pegler, 2015).

Difficulties associated with accessing land is not limited to these restrictions. Sauer & Leite (2011), discuss that since 2006, the price of land has been substantially rising. A noteworthy factor in these increased prices is the result of the vast number of foreign investors, which can and are willing to pay higher prices. The sale of land to foreign investors, most commonly referred to as land-grabbing, results in a higher price to purchase land for everyone. In 2010, 1,143 estates were owned by foreign investors, which accounts for 235,628.39 hectares of land in the state of Pará.

This increase in land prices also connects with a substantial financial gap between the rich and the poor. This gap results in the inability for many to purchase land that was once economically attainable. This difference in socio-economic status is notable in the way intensification was taking place in Boa Vista. Lewis (2008) explains that açai farming has been moving to upland areas—away from the naturally wet environments near the rivers—by those of higher economic status because they can afford the necessary irrigation systems needed for a water-based plant such as açai. Moreover, even amongst those of similar socio-economic status, gender inequality exists. Deere (2003) explains that there were three leading women’s land rights social movements that eventually led to the 2001 reform of land rights for women. This reform sought to adopt specific mechanisms to include women in agrarian reform. However, still today, there is little bargaining power and access for women. Thirdly, Medina et al. (2015) explain that there have been agrarian family farm policies in the past that have tried to increase production while also supporting farmers. Although these policies seem as if they would be a benefit, reality has shown that they benefit the lower-middle class, but not the most impoverished.

The variety of land restrictions for many could lead to an assumption that only rich men are contributing to the increased supply of açai. However, the land restrictions influence the crops that have low profitability and take considerable space the most. In many cases, this is the subsistence crops. For example, if a family needs to make a certain amount of money to maintain their livelihoods, they would need more land to make the same profits that arise from açai on a smaller amount of land. Therefore, those with a smaller amount of land tend to move towards açai because of its high-profit potential. As explained in *Section 2.1*, the intensification of a crop does not necessarily mean the purchase and expansion of land. Steward (2013) found that many were moving away from the production of other crops to intensify production of açai because it allowed them to reach the money needed for their families. Like crop intensification, açai intensification is the need or a desire for an increased focus on açai and the implementation of a procedure to increase the agricultural yield of açai based on the number of inputs. Overall, the intensification of açai is a feasible solution for the most impoverished communities.

Pollan (2006) explained that the intensification of corn in the United States had created vulnerabilities in the United States. He explains that the intensification of crops, especially when they become the primary focus of farmers, can have detrimental impacts. These repercussions foreshadow the fact that the intensification of açai could also bring forth concerns for harvesters. These consequences will be covered in *Section 2.1.4* after agroecosystem and NTFP vulnerabilities are determined.

2.1.2 Agroecosystem Vulnerability

The term vulnerability can apply in many contexts. Merriam-Webster (2018) defines being vulnerable as being “open to attack or damage.” Similarly, another source adds that the ease of something or someone being affected should garner focus when discussing the definition of vulnerability (Collins, 2018). These definitions bring forth general insight into what it means to vulnerable, but what does vulnerability mean



for an agroecosystem? Lanfang et al. (2002) explain that an agroecosystem vulnerability is any potential flaw in the complex agricultural structure that could result in the demise of the system. The term complex brings forth the idea that in order for an agroecosystem to deal with potential threats, such as climate change and market fluctuations, all parts of the system must be able to resist or adapt to the threats that exist. Throughout this research, the multi-focused approach of looking at the possibility of a vulnerability being a part of the economic, social, or environmental structure of an agroecosystem is implemented.

2.1.3 Vulnerabilities of NTFPs

In a review of previous research into NTFP vulnerabilities, there are two areas of prominence. The logistics of the transport & sale of NTFPs and the decision-making autonomy of the communities involved. First, Belcher and Schreckenberg (2007) discuss the relationship between NTFPs and vulnerabilities. They explain that storage, processing, and transport are some of the most challenging aspects in dealing with NTFPs. Specifically, they discuss that these issues mainly exist with fresh fruits. Second, they explain that many actors are usually needed and utilized to move the product from the forest or cultivation area to the market. To emphasize, they note that farmers exist in mass areas & markets are poorly developed, high prices usually lead to a heavy focus, and increased competition amongst small & large producers exists. They continue to explain that many overlook the potential impact these situations have on agroecosystems.

Second, Morsello (2006) discusses vulnerabilities associated with company-community relations. When communities work with companies, incomes tend to increase, but the research finds that the sole reliance on one product will not bring a community out of poverty. Morsello (2006) then provides the example of Brazil nut oil. Families tend to experience food shortages because of less focus on producing subsistence crops and more reliance on purchasing them. Additionally, companies teach the local population very little in the process and therefore the communities are unable to gain the necessary knowledge needed to continue autonomously.

2.1.4 Vulnerabilities of Açai

The high profits of açai which cannot arise from other crops, the land restrictions that exist, and movement away from the timber trade, are made apparent in *Section 2.1.1*. All these factors result in the need for the intensification of açai for many families within the communities in the Amazonia region of Brazil. Even those that have other means to produce income, still have the desire to intensify açai harvesting because of the high-profits that it can bring to their families (Pegler, 2015). Therefore, the rest of the region has at least some involvement with açai. In either case, there are three main vulnerabilities associated with açai. The vulnerabilities are as follows: limitations to maximizing yield, the fragility & seasonality of açai, and a lack of decision-making autonomy (Brondizio et al., 2002; Lewis, 2008; Cordeiro de Santana et al., 2015; Pegler, 2015).

Foremost, two major factors limit the ability to maximize yield for most açai harvesters; these factors are land accessibility and the ability to produce more açai sustainably. These limitations become a vulnerability for many because of the need to take part in the intensification of açai. Additionally, not all have the same ability to purchase land. The aspect of land accessibility was discussed thoroughly in *Section 2.1.1*, which highlighted land restrictions placed by the government, the increased costs associated with land, gender inequality, and policies that forget the most impoverished families/individuals. The second aspect is that there is an inequality over the availability of technologies, which includes genetically-modified seeds that are available today, and knowledge of how to maximize production out of a small area of land (Medina et al., 2015).



Secondly, the fragility & seasonality of açai is a vulnerability that gains strength with the intensification of açai. Pegler (2015) and Belcher & Schreckenberg (2007) both discussed this vulnerability associated with fruit production. In the case of açai, it must be processed on-site or quickly transported to preserve the quality and quantity of nutrients of the produced product. Additionally, the açai season only exists for half of the year in each of the leading açai regions in Brazil (Brondizo et al., 2002; Lewis, 2008; Pegler, 2015). The seasonality of açai not only influences the ability of açai harvesters to make a similar amount of money from açai throughout the year, but it influences the ability to rely directly on açai for a consistent income. Also, the price of açai is determined by the global and local market, which results in the price fluctuating throughout the day (Brondizo, et al., 2002; Lewis, 2008; Cordeiro de Santana et al., 2015; Pegler, 2015).

The fragility of the fruit also has a considerable influence on the decision-making autonomy of açai harvesters. The fact that açai must be processed quickly results in the need to preserve it for more extended transportation. Pegler (2015) explains that a harvester would need to possess processing equipment, have access to transportation, the ability to preserve açai, and be able to locate a buyer to control all aspects of the sale of açai. He explains that this is not feasible for most harvesters, so they turn to one of two options. First, they can sell directly to *atravessadores*, which have established connections with buyers. The second option is accepting the presence of an organization to provide the support needed. In either case, decision-making autonomy disappears.

The influence that an organization can have begins in the previous literature. Pegler (2015) explained that near Codajás, in the Eastern Amazonia area of Brazil, the government implemented and developed a cooperative that controls a regional product center for those in the area. However, this factory processed little of the açai in the area because it was "...unreliable, unrepresentative and of limited assistance." To provide clarity, he explains that despite providing an economic benefit, it was a minimal increase for açai harvesters and the cooperative was not providing a voice for the members. Similarly, Morsello (2006) found that companies that exist in the Amazonia region tend to bring economic benefit, but there are potential questions over the exploitation of the NTFPs, and there tends to be too much control from the companies themselves. This control results in the inability for communities to have decision-making autonomy.

Establishing the vulnerabilities associated with açai is the first step, yet it does not provide a method of understanding their impact on communities. The literature discussed in *Section 2.2* below, will explain how vulnerabilities are most easily understood by looking at agroecosystem resilience.

2.2 Agroecosystem Resilience

There is an extensive amount of literature that exists on the resilience of agroecosystems. Holling (1973), was one of the first to discuss this concept and many other researchers have utilized his definition. All their definitions explain that agroecosystem resilience focuses on the ability for a complex agriculture system to maintain stability, despite an outside threat (Borron, 2006; Chuku & Okoye, 2009; Lin, 2011). Another view looks at the agroecosystem being able to return to its original state despite an outside threat (Abson et al., 2013). However, if the definition is considering such extensive elements as natural disasters or market trends as potential threats to a system, then it must also consider the fact that

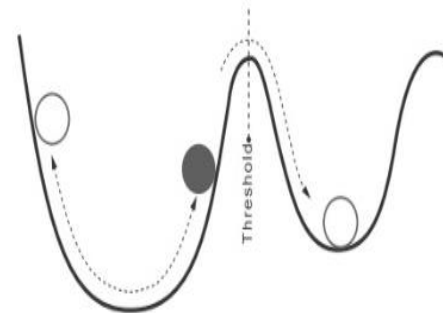


Figure A) Ecological Resilience Concept (Liao, 2012)



returning to the original state may not be possible (Lin, 2011). This possibility is represented most clearly in *Figure A*, which shows that in the face of disasters, an adaptive system will move to a new threshold, instead of returning to its original state (Liao, 2012). This new threshold is different from the original, but the key is the system is still functioning and stable.

As discussed, many different threats can exist for a system. These threats promote the reasoning of making sure a system is adaptive. Most literature today focuses around arguably one of the world's most pressing issues, climate change, which is considered an imminent threat. The relevance of climate change today is apparent through its existence in the UN's Sustainable Development Goals (UNDP, 2017).

Vulnerabilities in the agroecosystem can result in the system breaking when external threats arise (Lin, 2011; Liao, 2012). The system would break because vulnerabilities leave the agroecosystem open to attack. For instance, one such vulnerability in agroecosystems is explained by Adger (2000) when he explains that there is a tendency for individuals to develop too much reliance on one crop, especially if this crop has a high profit like açaf. Imagine that climate change comes through an area that focuses on one crop and this crop cannot handle the effect of climate change; therefore, the agroecosystem collapses. If there were many crops in the area, meaning this vulnerability did not exist. Most likely, some of those crops would be able to handle the initial effect of climate change. The agroecosystem would shake, but it would not collapse completely. Therefore, reducing the number of vulnerabilities in an agroecosystem increases the resilience of that system; hence agroecosystem resilience

2.2.1 Measuring Agroecosystem Resilience

There are two prominent ways that resilience of agroecosystems is measured. First, quantitative approaches to measuring resilience exist. In many cases, these approaches focus directly on the ecological aspects (Lin, 2011; Liao, 2012). However, agroecosystems contain social and economic systems too. Other researchers have looked at the livelihoods of individuals, which can provide insight into the ability for humans to be resilient in the face of impactful change. For example, one livelihood resilience framework looks at three main factors: a) buffer capacity, the ability for humans to temporarily handle the pressures of outside influences; b) self-organization, the amount of autonomy and connectedness found within the case being studied; c) capacity for learning, the ability for individuals to seek and to have access to resources that build knowledge to handle and be prepared for changes in the future (Speranza, et al., 2014). This framework does provide a keen understanding, yet it relies purely on quantitative measurements to understand social aspect. Schipper & Langston (2015) argue that relying purely on quantitative measurements fails to give justice to all the systems. Mainly because quantitative measurements cannot understand the complex social dimensions of qualitative measurement.

The second way to measure the resilience of agroecosystems is through qualitative approaches. One of the most common methods amongst qualitative approaches is utilizing Participatory Action Research or PAR⁸. PAR allows both the researcher and the participants to not only assess the community but to develop a long-term plan. Schipper & Langston (2015) assessed seventeen various frameworks that have brought forth indicators for assessment. In their findings, three overarching categories exist; a) flexibility, the ability for a system to handle change and to sustain itself again; b) options, which gives individuals, communities, and/or the environment to escape issues by having access to another means of survival or adaptation; c) learning, the ability to gain knowledge from past experiences. Based on this study, these groupings are meant to be overarching categories for the indicators set forth through the various

⁸ Participants and researchers work together to understand a problematic situation and to develop solutions for positive and influential change



frameworks evaluated. These items present a basis for understanding key factors to consider in any framework.

A reoccurring theme amongst the literature is that there should be hesitancy in selecting indicators, and indicators are not a complete understanding of the ability for an individual/family/community to handle the stress of external threats. Due to these factors, and the limitations of quantitative measurements, the FAO developed their SHARP or Self-Evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists framework for assessing change through the guidelines developed by Cabell & Oelofse (Schipper & Langston, 2015).

Based on the various claims through this research, utilizing behavior-based indicators can provide useful insight, while not falling into the fallacies related to quantitative research. Also, it is not limited to PAR, which is most successful through long-term research, when complete trust exists in the communities (Hennink et al., 2011). Therefore, behavior-based indicators are the basis for assessment in this study. Like the FAO framework, the thirteen behavior-based indicators of Cabell & Oelofse (2012) will flourish in this research because of the comprehensibility found in the indicators. Additionally, this framework covers the three main vulnerabilities of decision-making autonomy, the fragility & seasonality of açai, and the limitations of maximizing production. The decision-making autonomy of communities is covered mainly in the indicators of *Socially-Self Regulated* and *Builds Human Capital*. The vulnerability of the fragility & seasonality of açai is a part of the indicator of *Globally Autonomous & Locally Interdependent*. Lastly, the vulnerability of the limitations of maximizing production appears in the indicator of *Reflective & Shared Learning*. In each of these cases, there may be other relevant data found in additional indicators. The indicators shown are the most likely indicators to explain these vulnerabilities. In any case, the sheer presence of the vulnerabilities further emphasizes the relevance and importance of using this framework.

In turn, this framework provides a more holistic approach to understanding an agroecosystem. In this case, agroecosystem resilience is the ability for a system to return to stable functionality despite outside influences such as climate-change, price fluctuations, natural disasters, and market trends. The actual framework discussed above will appear in *Chapter 3*.

2.3 Grassroots Organizations (GRO)

Before proceeding with the conceptual framework, it is necessary to understand GROs for this research. This section first looks at various definitions of GROs. This definition will help develop an understanding of how and why GROs form. Second, this section will look at what influences the success and failure of a GRO. These factors can provide insight into the potential success or failure of the GROs in this study.

2.3.1 Defining GRO

Uphoff (1993) explains that there are two principal terms associated with a GRO. First, they are local. In this case, he directly focuses on the fact that the organization is of the place in which the intervention, action, or movement is taking place. The idea of local is a relative term, but to Uphoff, it merely means the area in which a group of individuals resides and interact with one another daily. Similarly, the Collins Dictionary (2018) definition, which refers to local as "...existing in or belonging to the area where you live, or to the area that you are talking about."

Second, Uphoff (1993) refers to the bottom-up approach of the organization. The bottom-up approach refers to decisions made by those lowest on a scale of power, i.e., citizens of an area. He considers it to be grassroots when a movement arises at a community or group level. Additionally, Mindry (2001) adds that a community-level organization is not always the basis of a GRO because it may encompass too many



individuals. In her case, she discussed that a GRO was developed by black women, fighting for a cause directly related to race within their communities. The lesson to be learned from this example is that the bottom-up approach is used when individuals share a similar issue and they lack power when working alone.

It is also important to understand that a GRO is a part of the collective action sector, which is different from the private and public sector. The private sector or for-profit organizations can form within the locality, but they do not have a basis in the same type of focus of a collective voice. The public sector, or a government organization, can be identified as a representative of the public, but it comes from an area of institutional power. This approach signifies a top-down approach (Uphoff, 1993). A GRO differs in the fact that the individuals involved come together to form a collective voice, in which they did not possess in the past or without forming a group together.

2.3.2 Factors of a Successful GRO

Bettencourt et al. (1996) were some of the first to explore the dimensions of what makes a GRO successful or not. They discussed three main areas that must be considered to have a successful GRO. The first is the concept of *Intragroup Coordination & Communication*. This concept means that the group comes to a consensus of decisions together, through various models. *Intragroup Coordination & Communication* arises when platforms such as weekly meetings exist, where individuals know that they have time to discuss ideas and concerns. Secondly, they discuss that there must be *Group Motivation & Morale*, which is a responsibility of the leadership. Some of the methods discussed were holding events for the group to socialize & celebrate successes, positive messages to the group, and a focus on the individual contribution of members. Lastly, the concept of *Group Identity & Cohesion* arrives. In this case, it is not only about members feeling as if they belong, but also that they feel as if they are contributing to the grander cause of the group.

The overall success does depend on the dynamics of everyone in the GRO as discussed above, yet, the leadership of the group must also consider many different aspects. Boehm & Staples (2005) first discuss that a leader must be able to set a direction and an organized path to reach the shared goal. The most important takeaway here is not that the path reaches a goal, but that leadership takes control of designing the path. This idea coincides with other literature emphasizes that leadership does not need to be one individual, but that multiple leaders making these types of decisions tends to be beneficial (Baral, 2013). Second, this research discussed the importance of incentives to the individuals, not within the leadership. Incentives also exist in the previous research by discussing the motivation of a group, but it also adds the fact that pointing out successes can guide those that are not as successful within the group dynamic. Thirdly, the research explains that leaders must not be overly controlling to allow the members of a group to be empowered and to allow flexibility in the path of the group. Lastly, the research reveals that developing small groups to work on tasks provides the benefit of diversity and a shared voice.

Literature rarely focuses on what causes a GRO to fail; however, the factors of success can provide an understanding of how the opposite can cause failure. Also, previous literature surrounding other types of organizational breakdowns can provide insight into a potential failure of a GRO. Pegler (2015) explains that the absence of long-term planning and the lack of listening to the voice of all members contributed to the demise of an organization associated with açai. These aspects were both highlighted in the previous literature discussed. Morsello (2006) brings forth a potential fault, by stating an organization should not focus directly on one goal. According to the research, a multitude of goals and foci allows for flexibility within the organization.



2.4 Bridging the Literature & The Research Gap

The first section provides a plethora of literature on crop intensification more generally, and then it focuses on how the intensification of açai has exacerbated vulnerabilities. The next section discussed that measuring agroecosystem resilience is the leading way to understand the vulnerabilities that exist. It also discusses that many communities have turned to organizations and the faults of these organizations; however, the discussion did not focus directly on GROs until the third section. The fact that it did not exist is because the literature review also revealed that there is a lack of understanding about what happens if organizations form internally within this context. The previous research has only discussed an example of a top-down cooperative and for-profit businesses, not highlighting the impact the intensification of açai can have on the development of GROs or what a GRO can do for agroecosystem resilience. Therefore, the third section exists to set a basis of an unexplored topic.

Additionally, even with the organizations that were studied, there was never a comparison made to a similar community experiencing no involvement at all. The reason this is important to understand can be clarified most easily through an example. Imagine a study that was researching agroecosystem resilience. In this study, researchers find that the community had an immense amount of crop diversity. This diversity could occur due to various reasons, and the community could provide some of the answers. However, there are many factors that the community may never consider in their daily lives. For instance, would the crop diversity be the same if the community lived closer to the market? If road access was available? By comparing two communities with similar traits, these factors are constants.

As stated in the introduction, the purpose of this study is to understand how the intensification of açai has influenced the agroecosystem resilience of Currálinho. Since there are communities that have GRO influence and ones that do not, both need to be compared to create a comprehensive outlook. The literature review revealed that a behavior-based agroecosystem resilience framework would be used to accomplish this understanding, which will gain an explanation in greater detail in Chapter 3. Before this explanation takes place, the revealing of the research questions occurs.

2.5 Research Questions

The research questions of this thesis find a basis in the literature review and the research gap that exists. Primarily, it is necessary to explore the following areas. First, there needs to be a thorough understanding of how the intensification of açai has influenced the development of organizational processes of GROs in Currálinho. Then, a reflection of these processes against the literature can provide insight into the potential success or failure of the GROs. Lastly, a community in which a GRO is present and one that is not will be explored to understand the influence the intensification of açai has had on the agroecosystem resilience of both types of communities in Currálinho. After these areas are understood, the answer to the central research question will arise; explaining the influence of the intensification of açai on the agroecosystem resilience of communities in Currálinho Pará, Brazil.

Research Question: How has the intensification of açai influenced the agroecosystem resilience of communities in Currálinho, Pará, Brazil?

- ❖ How has the intensification of açai influenced the development of organizational processes in Currálinho, Pará, Brazil?
- ❖ How do the organizational processes reflect against the factors of a successful GRO and the vulnerabilities that exist for açai harvesters?
- ❖ How much influence has the presence of Sementes do Marajó had on the agroecosystem resilience of a community in Currálinho, Pará, Brazil?



Chapter 3: Conceptual Framework

The various studies examined in the literature review point to the necessity of considering an approach that includes the environmental, social, and economic aspects of the agroecosystem. These areas should be considered because an agroecosystem is a complex system, which stretches beyond merely an NTFPs harvest. For this exact reason, Cabell & Oelofse (2012) developed behavior-based indicators since measuring the resilience of a system cannot be precise. Instead, the indicators provide insight into actions of communities that represent the presence—or the lack of—movement towards a system that can handle stress or shocks to the system. They explain that metrics for understanding resilience were underdeveloped before the time of their article. They believe this was not due to a lack of interest but rather that measuring resilience is as complex as the agroecosystems that they are trying to measure. Cabell & Oelofse (2012) clarify by explaining: a) a system that is resilient today, will not necessarily be resilient tomorrow due to internal conditions and the complexity of systems; b) short-term resilience can hinder long-term resilience; c) resilience is not always beneficial to the agroecosystem if a system rests in a lousy cycle; d) systems are context dependent and what is beneficial for one system may not be beneficial for another.

3.1 Thirteen Behavior-Based Indicators of Cabell & Oelofse

As discussed previously, Cabell & Oelofse (2012) have provided a starting point for assessing an agroecosystem. They explain that the presence of the indicators in an agroecosystem shows a system that is resilient, while the absence shows potential vulnerabilities of the system itself. This absence does not mean that system failure is inevitable, but these vulnerabilities could lead to a system collapsing if an external threat arises. Additionally, the broad indicators utilized allow for adjustments in different contexts. Cabell & Oelofse (2012) developed the following table to clearly explain the indicators, definitions, and factors to look out for when studying agroecosystem resilience.

Table A) Behavior-Based Framework Indicators of Cabell & Oelofse (2012)

Indicator	Definition	What to look for
Socially Self-Organized	The social components of the agroecosystem can form their own configuration	Farmers and consumers can organize into grassroots networks and institutions such as co-ops, farmer's markets, community sustainability associations, and community gardens
Ecologically Self-Regulated	Ecological components self-regulate via stabilizing feedback mechanisms that send information back to the controlling elements	Farms maintain plant cover and incorporate more perennials, provide habitat for predators and parasitoids, use ecosystem engineers, and align production with local ecological parameters
Appropriately Connected	Ecological components self-regulate via stabilizing feedback mechanisms that send information back to the controlling elements	Collaborating with multiple suppliers, outlets, and fellow farmers; crops planted in polycultures that encourage symbiosis and mutualism
Functional and Response Diversity	The variety of ecosystem services that components provide to the system; response diversity is the range of responses of these components to environmental change	Heterogeneity of features within the landscape and on the farm; diversity of inputs, outputs, income sources, markets, pest controls, etc.
Optimally Redundant	Critical components and relationships within the system are duplicated in case of failure	Planting multiple varieties of crops rather than one, keeping equipment for various crops, getting nutrients from multiple sources, capturing water from multiple sources
Spatial and temporal heterogeneity	Patchiness across the landscape and changes through time	Patchiness on the farm and across the landscape, mosaic pattern of managed and unmanaged land, diverse cultivation practices, crop rotations
Exposed to disturbance	The system is exposed to discrete, low-level events that cause disruptions without pushing the system beyond a critical threshold	Pest management that allows a certain controlled amount of invasion followed by selection of plants that fared well and exhibit signs of resistance
Coupled with local and natural capital	The system functions as much as possible within the means of the bioregionally available natural resource base and ecosystem services	Builds (does not deplete) soil organic matter, recharges water, little need to import nutrients or export waste
Reflective and shared learning	Individuals and institutions learn from past experiences and present experimentation to anticipate change and create desirable futures	Extension and advisory services for farmers; collaboration between universities, research centers, and farmers; cooperation and knowledge sharing between farmers; record keeping; baseline knowledge about the state of the agroecosystem



<i>Indicator</i>	<i>Definition</i>	<i>What to look for</i>
Globally autonomous and locally interdependent	The system has relative autonomy from exogenous (global) control and influences and exhibits a high level of cooperation between individuals and institutions at the more local level	Less reliance on commodity markets and reduced external inputs; more sales to local markets, reliance on local resources; existence of farmer co-ops, close relationships between producer and consumer, and shared resources such as equipment
Honors Legacy	The current configuration and future trajectories of systems are influenced and informed by past conditions and experiences	Maintenance of heirloom seeds and engagement of elders, incorporation of traditional cultivation techniques with modern knowledge
Builds Human Capital	The system takes advantage of and builds “resources that can be mobilized through social relationships and membership in social networks” (Nahapiet and Ghoshal 1998:243)	Investment in infrastructure and institutions for the education of children and adults, support for social events in farming communities, programs for preservation of local knowledge
Reasonably Profitable	The segments of society involved in agriculture can make a livelihood from the work they do without relying too heavily on subsidies or secondary employment	Farmers and farm workers earn a livable wage; agriculture sector does not rely on distortionary subsidies

The third column of this table provides insight into behaviors that can provide evidence—or the lack thereof—of each indicator. Therefore, when moving forward, these items will be utilized within the surveys/interviews produced, coding for analyzation, and the overall analysis of the resilience of communities. However, these are still broad and not contextually specific. In *Section 3.2.1*, the path to specifying the indicators transpires.

3.2 Pilot Study

As described, the conceptual framework is relative to this study; however, it is meant to be a broad framework that can adapt to many different environments. Primarily, it was necessary to understand the different factors that exist in communities within this context. Therefore, a pilot study took place in a community titled Anjo da Guarola #4. This community is a similar distance from Curalinho compared to the communities researched in this study, has a similar population of about 60 families, and over 95% of the community dedicates at least some of their work to açaí. A combination of twenty interviews and two focus groups allowed for the refining of the conceptual framework to indicators that were congruent with what exists in the research communities. In *Table B*, the names and what to look for remained the same from the chart above, however, a third category of the indicators developed from the pilot study is included. As stated previously, the indicators and what to look for were provided directly from the literature (Cabell & Oelofse, 2012).

Table B) Adapted Behavior-Based Framework Indicators of Cabell & Oelofse (2012)

<i>Indicator</i>	<i>What to look for</i>	<i>Factors based on Pilot Study</i>
Socially Self-Organized	Farmers and consumers are able to organize into grassroots networks and institutions such as co-ops, farmer’s markets, community sustainability associations, community gardens, and advisory networks	1) Shared work across families
		2) Internal trade networks
		3) Cooperative selling areas (Port)
		4) Decision-making autonomy
Ecologically Self-Regulated	Farms maintain plant cover and incorporate more perennials, provide habitat for predators and parasitoids, use ecosystem engineers, and align production with local ecological parameters	1) A habitat for all
		2) Understanding the limits of production
Appropriately Connected	Collaborating with multiple suppliers, outlets, and fellow farmers; crops planted in polycultures that encourage symbiosis and mutualism	1) Crops interplanted in polycultures
		2) Sell to multiple type of buyers
Functional and Response Diversity	Heterogeneity of features within the landscape and on the farm; diversity of inputs, outputs, income sources, markets, pest controls, etc.	1) Various types of growing areas
		2) Multiple income sources



Indicator	What to look for	Factors based on Pilot Study
Optimally Redundant	Planting multiple varieties of crops rather than one, keeping equipment for various crops, getting nutrients from multiple sources, capturing water from multiple sources	1) The number of different crops being planted 2) Equipment for various crops 3) Nutrients from various sources
Spatial and temporal heterogeneity	Patchiness on the farm and across the landscape, mosaic pattern of managed and unmanaged land, diverse cultivation practices, crop rotations	1) Mosaic pattern of managed and unmanaged land 2) Diverse cultivation practices
Exposed to disturbance	Pest management that allows a certain controlled amount of invasion followed by selection of plants that fared well and exhibit signs of resistance	1) Selection of crops based on experience with Pests
Coupled with local and natural capital	Builds (does not deplete) soil organic matter, recharges water, little need to import nutrients or export waste	1) Builds organic matter 3) Little need to export waste
Reflective and shared learning	Extension and advisory services for farmers; collaboration between universities, research centers, and farmers; cooperation and knowledge sharing between farmers; record keeping; baseline knowledge about the state of the agroecosystem	1) Connection between universities, research, and farmers 2) Knowledge sharing between farmers 3) Record keeping 4) Knowledge about the state of the agroecosystem
Globally autonomous and locally interdependent	Less reliance on commodity markets and reduced external inputs; more sales to local markets, reliance on local resources; existence of farmer co-ops, close relationships between producer and consumer, and shared resources such as equipment	1) Selling to local market 2) Relationship between producer and consumer
Honors Legacy	Maintenance of heirloom seeds and engagement of elders, incorporation of traditional cultivation techniques with modern knowledge	1) Engagement of Elders knowledge 2) Maintenance of heirloom seeds
Builds Human Capital	Investment in infrastructure and institutions for the education of children and adults, support for social events in farming communities, programs for preservation of local knowledge	1) Investment in infrastructure and institutions for education of children and adults 2) Support for social events in farming communities 3) Programs for preservation of local knowledge
Reasonably Profitable	Farmers and farm workers earn a livable wage; agriculture sector does not rely on distortionary subsidies	1) Earn a livable wage 2) Little to no reliance on Governmental Assistance



Chapter 4: Methodology

The formerly mentioned research questions were the basis of this study, which intends to develop comprehensive, advantageous, and germane answers to those questions. To do so. This study required a structured procedure, distinct location, a specific qualitative method, sound collection & analysis tools, and analysis methods. Also, the consideration of ethics, trustworthiness of the data, and the limitations will follow. The following section will provide an inclusive view of all aspects of the methodology undertaken throughout the study.

4.1 Procedure

To be able to complete the research promptly this research required a structured, yet, flexible schedule. This flexibility allowed situations to arise, while also ensuring completeness. Each step led to a successful research experience. The step by step procedure is found in *Table C* below.

Table C) Research Procedure used throughout the Research

Research Procedure
Present research proposal
Meet with organizations, researchers, and scientists
Develop an interview & focus group guides, agricultural surveys, and observation plans
Meet with organizations, government officials, and açai sellers/specialists in Curralinho
Meetings about site selection & site selection itself
A pilot study to refine the conceptual framework
Research of both communities
Organization of results
Analysis of results and follow-up interviews

4.2 Site Selection

The açai palm tree thrives across the Amazon region. This region includes the countries of Brazil, Colombia, Ecuador, Peru, Bolivia, Guyana, French Guiana, and Suriname. The berry is most commonly known for its presence in Brazil for two reasons; Brazil has the largest landmass in the Amazon region, which results in the highest presence of açai, and because the first considerable exportation of the berry happened in the states of Pará and Macapá in Brazil (Tunico, 2018). As a result, this research was essential to take place within one of these two regions to fully understand the impact of the intensification of açai on agroecosystem resilience.

4.2.1 State of Pará and the Island of Marajó

The state of Pará is found in the Northern part of Brazil and is the location of the outlet for the Amazon River. It is also known for being located along the equator, resulting in an equatorial climate. Due to its location, this area receives an average rainfall of 1,500 mm per year (Encyclopedia Britannica, 2018). The largest city, capital, and port of Pará are in Belém. This port allows for the exportation of goods, particularly NTFPs, which are collected and sold in large quantities in many locations throughout the city. The primary market in the area is called the Ver-O-Peso Market, which is full of many goods to be sold to the local people & the occasional traveler or in mass scale through those passing through the port. The most common goods found today are fish, fruits, vegetables, nuts, local herbs, and a plethora of açai.



The climate, a vast number of rivers, and the port all contribute to the state of Pará being the largest supplier of açaí in the world. Also, a nearby city titled Castanhal is home to an American company that purchases, processes, and exports açaí. The second largest supplier, and home to an American based company that purchases, processes, and sells açaí exists in the state of Macapá, to the north of the island of Marajó (Jeoval de Matos, 2018).

The island of Marajó is known for being the home of the ancient Marajoararas indigenous culture. Today, it is known for endless untouched land, diverse landscapes, and water buffalo that gaze the countryside—and the streets. It is also surrounded by the rivers, ports, and communities that supply the world with an abundance of açaí. To the Northwest of the island is Macapá and to the Southeast is Belém; the sites of the two previously mentioned ports that export açaí. The Atravessadores (2018) explained this area has two different açaí seasons. To clarify, the island of Marajó is so large that it has two açaí season. In the areas surrounding Macapá, the açaí season is from January to August and in the Belém region, the season is from August to December. This diversity not only allows for access to açaí throughout the year, but it also provides consistent work for the *atravessadores*. However, those that work with the transport of açaí do not all have the same function in the cycle. Typically, those with the smaller vessels go to the local communities and bring it to the nearest large port for the larger vessels to deliver it to both large port/exportation areas (Atravessadores, 2018).



Map A) Reference of the Island of Marajó

4.2.2 Curralinho

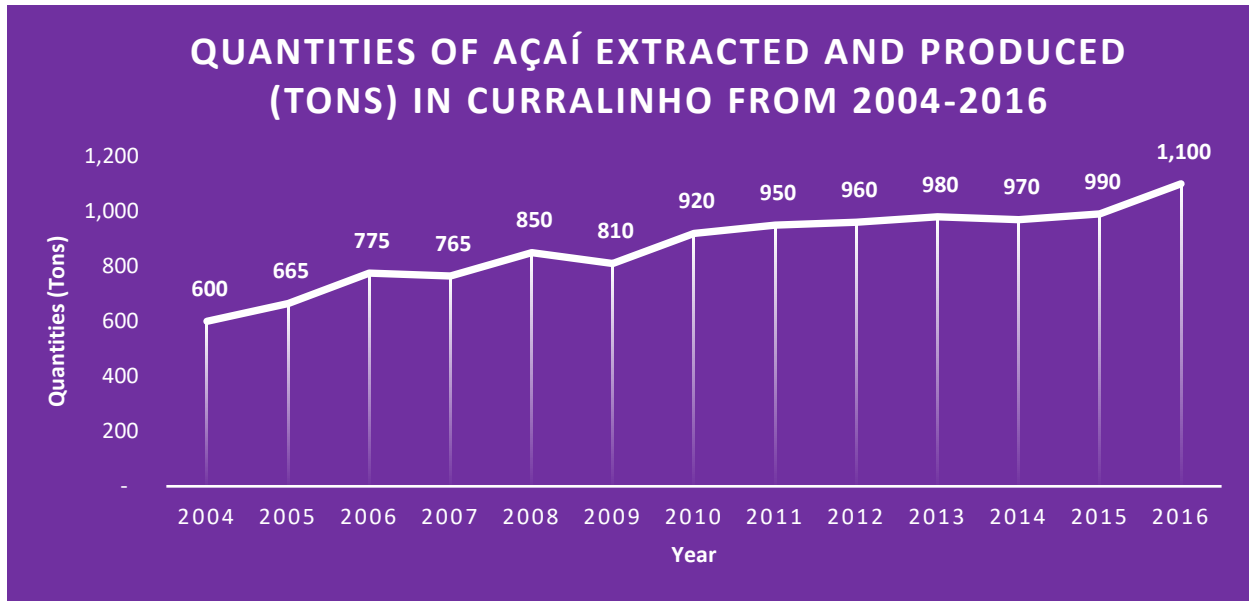


Map B) Reference of Curralinho

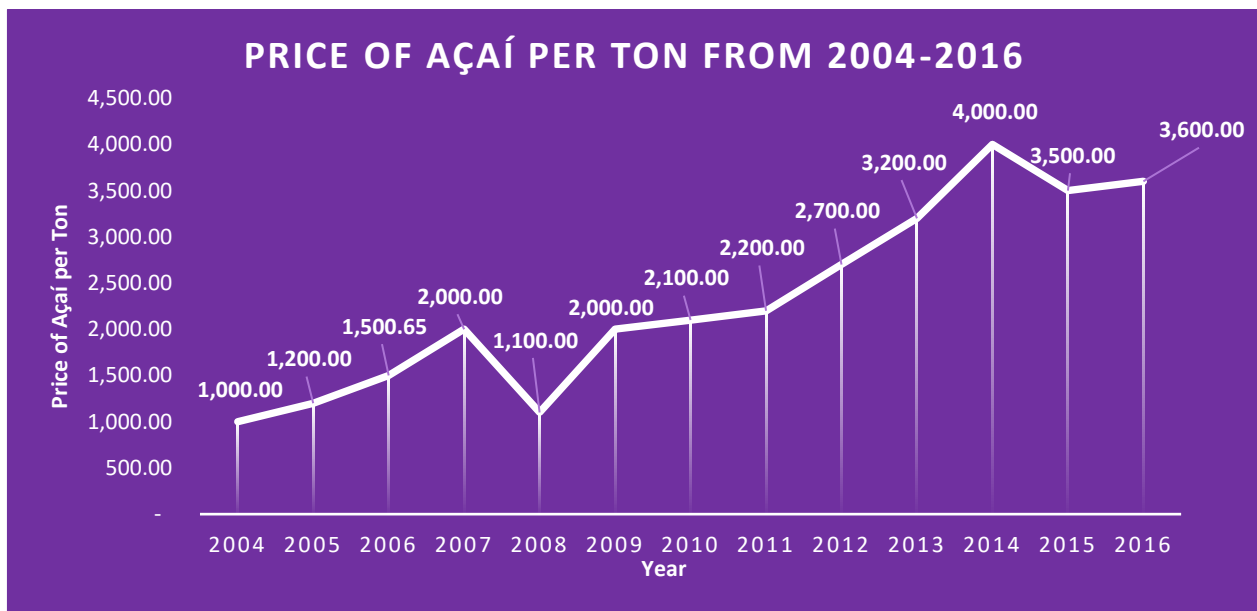
Curralinho is one of the small port cities that thrives off harvesting, processing, and selling açaí on the island of Marajó. It is located directly on the Belém river, which is a major transport route for the region. In 2016, it had an estimated population of 32,881 individuals in the municipality, with approximately 7.89 habitants per square kilometer (Prefeitura de Curralinho, 2018).

From 2004-2016, when the international demand increased for açaí, the supply in the area steadily increased as well. This increase is apparent in the IBGE (2018) statistics found in *Graph C*. As seen within the state of Pará, the price of açaí has also steadily increased; except for in 2008, when the world experienced an economic crisis and in 2014 when temporal inflation occurred due to the World Cup. The general consistency and formerly mentioned spikes are found in *Graph D*. This area was chosen because this region produces a significant amount of açaí and because preliminary research revealed that nearly everyone in this area is involved in the açaí trade.

Graph C) Quantity of Açaí in Tons in Currálinho (Instituto Brasileiro de Geografia e Estatística, 2018)



Graph D) Price of Açaí Per Ton in Currálinho (Instituto Brasileiro de Geografia e Estatística, 2018)



The increase in demand/price came at a time of transition for the area of Currálinho. In previous decades, a lot of the population thrived from the rubber boom that took place in the region. Then, in the 1970's, an organization called Fonesca, which was Portuguese owned, developed the first timber factory in the area. Many small factories were opening, and individuals went from working in the factory to harvesting and processing timber themselves. The timber industry hit its peak in the 1990's. The longevity of the timber



industry led to massive deforestation, throughout the region. As a result, governmental policies started to develop, putting significant restrictions on the industry. Also, a general lack of timber resources led to difficulties for the harvesters. The timber industry—legal and illegal—still is prominent in this area today. However, the difficulties surrounding this once thriving industry had many looking for another solution (Oliveira, 2018).



Image B) Shipping of Timber in Currálinho, April 2018

Simultaneously in the 1990s, many were moving from the communities to the city. In an interview with Olivia (2018), an açáí seller, said that “There was a greater understanding of the importance of education during this time. Many wanted their children to have a good education, so they could have a better life than we had it.” These families still wanted to enjoy açáí daily, which led to the movement of açáí from the communities. This movement also created the need for jobs in the area.

In this time, many started to process and sell the açáí that was coming into the city. Maria (2018), was one of the first to sell açáí in the community. According to her, when she first started, she had many people buying from her shop, but today, there are too many people selling it in the area. The actual number of sellers is recorded by the ABAC which is responsible for making sure that those that process and sell açáí maintain a clean working space. They do this to prevent the transmission of Chagas, which is a parasite that can cause congestive heart failure if left untreated (Maria, 2018; Tunico, 2018). According to the VP of ABAC, there are 172 people registered to sell within the city and approximately thirty sellers of açáí that are not registered—illegally selling—in Currálinho (Tunico, 2018). To gain insight into the distribution of açáí selling shops, the researcher created a map of the observed sellers in April. This map represents the low season of açáí in the area, which ultimately means fewer sellers are working within the market. In April, there were 75 sellers of açáí, which appear in *Map C* below.

Map C) Active Açáí Sellers in Currálinho, April 2018





Image C) Rasa of Açai

The season that açai is facing also influences the price to buy and to sell açai. Açai sells in a small basket called a *rasa* (see *Image C*), which holds about 14 kg per basket. During the low season, one *rasa* sells for approximately R\$50 or around USD 12.50. In the high season for açai, one *rasa* sells for about R\$15 or about \$3.75 (Atravessadores, 2018; Juliana, 2018; Olivia, 2018). This significant difference in price is why fewer individuals are selling during the low season. Still, these prices have little influence on the individuals that buy açai. According to Maria (2018), if an açai seller has enough regular buyers, the higher prices do not influence business. She explained that she could push the higher prices associated with the season to the buyers and make the same profit throughout the year. Not all sellers have the same amount of regular business, leaving some to work only during the high season.

In addition to those that sell açai, two grassroots organizations house their central office within the city limits. The first is Cooperative Mista. This GRO arrived in 1998, with their focus being on açai. In addition to their açai projects, they also provide fruit juices to schools and have been involved in the selling of local nuts as well. They work with one central community, but they also purchase products from other communities in the region. They sell their açai directly to the international market (Jeoval de Matos, 2018). The second is a GRO in the area called Sementes do Marajó. Regarding açai, Sementes do Marajó is working directly within the Currallinho region and began in the early 2000s. They sell açai to the local government, which purchases açai at a higher price. A full description of Sementes do Marajó can be found in *Section 4.2.4*.

Overall, the presence of açai is dominant within the city limits. It not only is consumed daily by the city, but it also provides various jobs for those in the area. The *atavessadores* sell the açai at the port to those that process and sell it locally, the two GROs provide jobs, and there are other positions, such as the VP of ABAC, which are responsible for the regulation of the market. Of course, this is just within the city limits of Currallinho. Many others rely on açai for their incomes; they live in the communities surrounding Currallinho.

4.2.3 The Communities

Choosing the site location until this point was because Brazil and the state of Pará were the largest producers of açai. Currallinho was selected because they produce a high level of açai & they have some of the most dedicated communities to the açai trade. The communal selection had different criteria; because numbers do not exist about the actual production of each community. When selecting communities, it was essential to keep as many factors as consistent as possible. As the aim of this research required finding a community with a strong presence of a GRO, discussions with both GROs took place. In a conversation with Cooperative Mista, their primary focus area did not have a nearby community with relatable factors for comparison. Also, it was difficult to access, and there was a desire not to have this area studied. In contrast, in conversation with the GRO Sementes do Marajó, there was access to a community, the location was accessible, and there were many communities nearby that were of a similar size and had a similar dedication to açai. The community is titled *Coração de Jesus*.

After selecting this site, it was essential to find a community that shared similarities between *Coração de Jesus*. In discussions with Sementes do Marajó, government officials, and a local priest, it was decided that the most similar community based on location, community size, and dedication to açai, was



Comunidade São Jorge. Below, Table D provides the comparison discussed above between the two communities and Map D show their locations.

Table D) Comparison of the Communities

<i>Comparable Factor</i>	<i>Coração de Jesus</i>	<i>Comunidade São Jorge</i>
Location	2 1/2 Hours by Common Boat	2 ¾ Hours by Common Boat
Community Size	85 Families	72 Families
Dedication to Açai	>95% of Families Harvest	>95% of Families Harvest
GRO Influence	Sementes do Marajó	None

Map D) Reference of the Communities



4.2.4 Sementes do Marajó

The development of a reliable partner to buy açai from the members of Sementes do Marajó was the first focus of this GRO. In the first year of development, they established a partnership with the Municipality of Curralinho. This establishment meant that the açai would go to both the government officials and the local schools within Curralinho. The deal set forth was that the Municipality of Curralinho would purchase only high-quality açai from the members of the organization two-days a week, but they would purchase this açai at a higher price that stayed consistent throughout the year (Oliveira, 2018).

Sementes do Marajó then turned their attention to the transportation and the development of training for members of its organization. In a search for a means of transport, Sementes do Marajó received a donated boat through their established connection within AMAM (Oliveira, 2018).



They also used existing connections with the Federal Rural University of Amazonia located in Belem, Pará, Brazil to establish training sessions. These sessions had the intention of teaching members the proper methods to intensify açai production sustainably. This training revolved around the management of açai palm trees and taught how to extract palm-hearts from the trees when they no longer produced at a high level (Oliveira, 2018). Today, the focus of Sementes do Marajó is still primarily on the sale of açai, yet they also realize that they must expand to other markets. In the last three years, they have held a training on fish-farming, which was the initial push to help diversify the focus of the GRO. Secondly, Sementes do Marajó desires to establish a stronger presence within Currálinho, by seeking out other members.



Image D) Cooperative Sementes do Marajó

4.3 Qualitative Case Study Method

First, it was necessary to recognize the type of qualitative method that would be the most relevant to understand the influence of Sementes do Marajó on agroecosystem resilience. Robert Stake (1995) and Robert Yin (2003) have two different methodological guidelines for approaching case studies, yet they are both grounded through the constructivist paradigm. In the case of this methodological approach, this paradigm considers the fact that reality is a social construct and calls for a complete understanding of the contextual setting, positionality, and perspective of both the participants and the researcher (Baxter & Jack, 2008). In simpler terms, two of the foremost academics in developing case study methodology agree that the complexity of human-based studies requires the willingness to accept that reality is the result of the individual perspective of every person. Yin (2003) further emphasizes this point when he explains the appropriateness of a case study approach takes place when: a) the situation or phenomenon takes place within grey areas; b) the researcher desires to cover contextual situations because of its relevancy; c) manipulation of behavior cannot happen in the study; d) the study is focused on understanding “how” and/or “why.” As discussed above, this approach accepts and celebrates complexity and provides a sound basis to understand these respective cases.

4.3.2 Types of Case Studies

A case study approach is focused; however, it is a broad term due to the many different types of contextual situations, desired outcomes, and limitations that it can represent. Due to these considerations, there are different types of case study approaches to consider. A simplified table of the various types of case studies is available in *Table E*.



Table E) Explanation of Different Case Study Types (Baxter & Jack, 2008)

<i>Case Study Type</i>	<i>Definition</i>	<i>Goal</i>
Explanatory	An approach that is utilized when “causal links” are sought in a case in which an intervention has taken place.	To discover the effectiveness of an intervention through understood outcomes
Exploratory	Like the explanatory approach, yet in this case the outcomes of an intervention are unknown and/or are simply not clearly understood	To gain an understanding of the effectiveness of an intervention when the potential outcomes are not known
Descriptive	Used to develop an explanation of a phenomenon or intervention in its respective context	To pronounce the intrinsic details of a case
Multiple Case Study	Utilized to understand the differences/similarities between two (or more) similar, yet different cases	To successfully compare two (or more) cases to understand the effectiveness of each respective situation
Intrinsic	This approach is developed with the intention of understanding something that is simply of interest to the researcher	To gain a better understanding of a situation or case
Instrumental	Opposite of the intrinsic case, in this situation the actual case is not of interest, the focus desires to use the case to learn more about a theory or situation	To concentrate a theory or to provide insight into an issue
Collective	This approach utilizes a collection of cases to understand a phenomenon or situation	To understand a situation across multiple studies

This study compares two communities; thus, it follows the multiple case study method. As evidence, this case: a) has many factors such as personal relationships and previous interactions amongst individuals that fall within ‘grey areas’ of research; b) the context of this study is relevant due to influencing factors of distance, previous experience and the political climate of Brazil; c) there was no control over their behaviors; it was about understanding the situation within the context; d) this study sought to understand how the intensification of açai has influenced two different communities. The last point also explains why the multiple case study approach is appropriate. Since this research is a “snapshot in time,” the only way to understand the influence of Sementes do Marajó has had within the community is to find a similar case that did not experience this same influence. Overall, a multiple case study approach is not only appropriate but arguably necessary to answer the research questions.

4.4 Data Collection

Once again, this research aims to understand the influence the intensification of açai has on the agroecosystem resilience of communities. There is not one single data collection method that could be utilized to understand the influence that exists. To collect the necessary information for analysis a combination of document analysis & researcher interviews, in-depth interviews, focus groups, agricultural surveys, and observation were all utilized to answer the research questions.



4.4.1 Document Analysis & Researcher Interviews

Before data collection began, it was necessary to refine frameworks, gather information about açai, and to see where current research is today through analyzing previous documents of researchers. Also, to gain a more thorough understanding, meetings were set up with current and past researchers of açai. Also, information that was available through national agricultural surveys provides data on açai, which was analyzed to understand their relevance to this topic.

4.4.2 In-Depth Interviews

First, the researcher conducted semi-structured interviews in twenty different households within each community. The households were selected by Simple Random Sampling (SRS) based on the distribution of households. In each case, a balance of gender was sought after but came second to ensuring that the sampling was randomly selected. In the case of Coração de Jesus, twelve of the participants were male, and eight were female. In Comunidade São Jorge, nine of the participants were male, and eleven were female. This count leads to a total of twenty-one males and nineteen females between both communities.

A semi-structured interview guide was developed (*Appendix A*), trust was established & maintained through the end of the interview, questions were open & empathetic, and participants were motivated to tell their story through probing questions (Hennink et al., 2011). The interviews sought to understand all the indicators of the conceptual framework discussed in *Chapter 3* and probing questions were utilized to bring forth additional information that was introduced by the interviewees.

Second, the researcher conducted a semi-structured interview with critical individuals in Currallinho that could not only provide information about Sementes do Marajó but also about organizational development & processes and the state of açai within the city limits. Table G below lists the other individuals interviewed, their relativity to this study, a general guideline of the information they brought to the study, and the date of the interview. The names of most of the individuals have been changed to maintain anonymity. The exception to this is the Secretary of Environment, the VP of ABAC, and the presidents of both grassroots organizations, whom all permitted the use of their real names.

Table F) List of Secondary Interviews in Currallinho

<i>Name</i>	<i>Position</i>	<i>Relativity</i>	<i>Date of Interview</i>
Adriana*	Açai Seller #1	Information about processing and selling açai in Currallinho	04/05/2018
Juliana*	Açai Seller #2	Information about processing and selling açai in Currallinho. Historical background of açai sellers.	04/05/2018
Maria*	Açai Seller #3	Information about processing and selling açai in Currallinho. Historical background of açai sellers.	04/05/2018
Olivia*	Açai Seller #4	Information about processing and selling açai in Currallinho. Historical background of açai sellers.	04/05/2018
Tunico	VP of ABAC	The path of açai and background & demographic knowledge of açai sellers	04/05/2018
Gabriel*	Government Official	Background of Currallinho and information about cooperatives in the area.	04/05/2018
Lucas*	Government Official	Knowledge of Cooperative Mista	04/11/2018



<i>Name</i>	<i>Position</i>	<i>Relativity</i>	<i>Date of Interview</i>
Carlos Roberto Oliveira	President of Sementes do Marajo	Currallinho product & trade information. Information about Sementes do Marajo	04/11/2018 & 04/13/2018
Sandro Abreu	Secretary of the Environment	Government projects, initiatives, how açai affects the environment, and how his department is trying to increase the sustainability of açai	04/13/2018
Manoel Jeoval de Matos	President of Cooperative Mista	Information about Sementes do Marajo	04/13/2018
Leonardo*	Member of Sementes do Marajo	Information about Sementes do Marajo	04/15/2018

*Names that have been changed for anonymity

4.4.3 Agricultural Surveys

In Comunidade São Jorge there was a total of thirty-six agricultural surveys completed. In Coração de Jesus, thirty-eight surveys. The mixed numbers are due to a slight difference in population size. To collect this data, SRS was used to reach the sample size needed. To complete these surveys only the items planted by the family are relevant. The surveys recorded the local name and use of the plant for each family. The quality of results, confidence, and margin of error are found in the results, *Chapter 5*. This section will focus on how the results were analyzed.

A method of calculating the results had to be decided upon before the surveys were conducted and utilized for analysis. There are two essential notions when looking at measuring diversity. The first is the *evenness* of diversity in the area. In simple terms, this looks at how many of each crop is in one area. Knowing how many of each crop that exists helps to understand if one species is heavily dominating an area or if in a single area, many crops are abundant. The other method is looking at species *richness*, which considers the number of different crops that can be found in an area (Jarvis et al., 2008).

The framework of this research aims to understand if the agroecosystem is “Optimally Redundant,” in one of its indicators. Furthermore, one aspect of this indicator seeks to learn the number of different crops grown in an area (Cabell & Oelofse, 2012). Therefore, measuring species *richness* was the most appropriate for this research. However, there are limitations within this concept. Most notably, these methods do not account for abundance in an area, which is in the *evenness* surveys (Spellerberg, 1991). A lack of appearance means that two areas could have twenty different crops, but one may have more of a species and a few of another. However, in both communities, the crops were mostly located in home gardens of a similar size. This restriction in land alleviated the limitation of the *richness* methods.

Like the two notions, two widely-accepted formulas have been developed to understand species *richness*. First, Margalef’s Diversity Index uses a formula that bases its calculation on all the different species in the area. (Clifford & Stephenson, 1975). Second, Menhinick’s Diversity Index looks directly at the species (Whittaker, 1977). In other words, Menhinick’s Diversity Index is considering the planted crops; not necessarily everything in the area. For this research, it is important to understand what has been planted by choice and therefore Menhinick’s Diversity Index is the most appropriate and can be seen in Formula A.

Formula A) Menhinick’s Diversity Index Formula (Whittaker, 1977)

$$D = \frac{s}{\sqrt{N}}$$



4.4.4 Focus Groups

In each community, two separate focus groups took place (guide in *Appendix B*). Gender determined the groups; one focus group was with men and the other with women. This separation ensured each voice existed in this study. Community-based focus group(s) are known for helping to explore new topics that may not have been addressed before in the community, gain a range of views, to understand local culture & norms, to understand how groups make decisions, and the information can also be paired with data found in the questionnaire itself (Hennink et al., 2011). In this research, this method primarily allowed the researcher to get more insight into general thoughts and ideas shared amongst the communities. Also, it helped the researcher to learn cultural norms and how groups make decisions in these areas.

In addition to asking the focus group participants questions & facilitating conversation, the researcher had the focus groups take place in a “Matrix Ranking” assessment. The purpose of this tool is to either rank or prioritize responses to one focused question. For instance, one of the foci of this research is to understand the influence of Sementes do Marajó from an insider perspective. In this case, the focus group will have multiple responses to give, but it may be hard to understand which response is the most agreed upon within a focus group. Instead of having the focus group spend a significant time trying to decide what is the most important over another, especially when multiple responses exist, this tool calls for a comparison of one response versus another until each response is crossed with the others individually. (Galindo-Gonzalez, et al., 2016). A matrix is utilized to accomplish this goal. Each response is put in a column going downwards, and then perpendicularly placed in the same order in a row. The boxes that are either repetitive or have a response tested against itself were crossed out. Then the group compares two individual responses, one after another. The steps can be more clearly understood by viewing *Matrix A* below.

Table G) “Matrix Ranking” Assessment (Galindo-Gonzalez, et al., 2016)

Option	Option					Score	Rank
	1 Recreational park	2 Repave 3 rd avenue	3 Grants for storefront improvements	4 Expand library	5 Restore railway depot		
1 Recreational park		2	1	4	1	2	
2 Repave 3 rd avenue			2	2	2	4	
3 Grants for storefront improvements				4	3	1	
4 Expand library					4	3	
5 Restore railway depot						0	

This process continues to take place until all responses are listed. Then the occurrences of each response are counted, with the most commonly prioritized responses ranked at the top, and the least common responses are at the bottom. Overall, this tool is a simple and efficient method that can be utilized to prioritize responses when multiple answers can be correct (Galindo-Gonzalez et al., 2016).



4.4.5 Observation

Beyond in-depth interviews, agricultural surveys, and focus groups, a significant amount of time went to observing the communities. Notes were taken, including the date and time, to record details within the interviews, surveys, and focus groups. Also, notes helped to keep track of observations as the researcher spent time in the communities themselves. In each community, living with a local family, sharing space with others outside the interviews, and enjoying food together allowed for a significant amount of observational data to be collected. These observations allowed the researcher to collect data that would not necessarily be spoken and to triangulate data found in the surveys, interviews, and focus groups. For instance, interviews can reveal information about the way in which a community works together, while observation can confirm instances in which this is happening or not. This confirmation can either legitimize or contradict a claim.

4.5 Data Analysis

The various data that has been collected by all the methods were then analyzed. The observational data and document analysis & researcher interviews allowed for triangulation of findings from the interviews, focus groups, and agricultural surveys. The agricultural surveys were analyzed using Menhinick's Diversity Index Formula as discussed previously. To perform an analysis of the interview data this researcher followed the guidelines of Hennink, et al. (2011). They titled this process the Analytic Cycle, which includes: developing codes, a comparison of similarly categorized information, categorization of these codes, and the development of a theory based on the results. This process is a cycle and not a direct path, so these steps continued to take place until the information is saturated and comprehensive.

Hennink, et al. (2011) explain that the development of codes has two purposes. Codes help to identify the range of issues and to illuminate meanings of them and to categorize similar data, so consistencies can be easily seen and compared. A codebook includes the codes used and the categorization of these codes or coding families of the original codes. The codebook for this research is in *Appendix C*, and it begins with the thirteen behavior-based indicators from the conceptual framework. In some of these coding families, additional codes were developed based on the interviews & focus groups that took place. Additionally, there were four coding families developed based on participant observation.

4.6 Ethical Considerations

To ensure ethical research, three main principles were considered throughout this study. The first of the principals is autonomy. In this case, this means respecting the interviewees. One of the most clear-cut ways of honoring and respecting the interviewee is by giving informed consent. Consent means informing the participant and giving them full autonomy to accept or to not accept being a part of the study (Orb et al., 2001). In this study, the individuals were informed about the nature of the study, the reason the study was being performed and then asked if they were willing to participate in one of the formally mentioned data collection methods. The second principle is beneficence. In this case, anonymity not only extends to changing names but to protecting the identities beyond the name. For instance, if a name was substituted, but the job title is maintained then community members could still know the participant (Orb et al., 2001). In this research, if the participant desired to remain anonymous for any reason, then every precaution was taken to maintain this anonymity. The last principle to consider is justice. This principle focuses on implementing actions of equality and considering the vulnerabilities and limitations of participants. Referring to equality means that the study should not just focus on highly vocal individuals, but also those that may not be as quick to talk (Orb et al., 2001). In this research, separation of focus groups and a focus on diverse participants ensured this happened. Additionally, considering the vulnerabilities of the



participants requires carefully selecting and understanding how items mentioned in the thesis can influence others (Orb et al., 2001). In consideration, this thesis has been reviewed by the researcher, looking purely for this ethical consideration.

4.7 Trustworthiness of the Data Analysis

Triangulation, or the input of multiple sources to “check” findings amongst different collection methods, is a standard method in quantitative/mixed-method research. However, as qualitative research continues to emerge as a reliable source of information, there have been many discussions over triangulation in qualitative research as well. One of the most common methods is using multiple sources of data collection (Golafshani, 2003). In this study, five data collection methods were utilized to be able to triangulate information. Also, before the study began, a significant amount of due diligence was performed. First, there was extensive research performed by reading and understanding previous studies. Second, upon the first arrival in Brazil, the principal researchers of açai were interviewed in person, on the phone, or through e-mail messages. This diligence set the research in the right direction and helped to develop trustworthy and reliable methods and interviews.

4.8 Limitations and Positionality

This research faced three limitations during the period of research. First, was the limitation of time. The schedule discussed above provided adequate time to collect the information provided. More time would have allowed for additional triangulation of data through analyzing other communities that did and did not have the influence of Sementes do Marajó. Second, was a limitation of access. Despite being able to look at the difference between Sementes do Marajó and a community with no outside influence, it was not possible to evaluate the second GRO in the area. A lack of restriction could have provided a more comprehensive look at how a different GRO influences agroecosystem resilience. Lastly, there were limitations related to the positionality of the researcher.

Many individuals within Curralinho saw the researcher as someone that wanted to invest in the area. This perspective could have potentially skewed responses. Additionally, although there were many attempts to explain that the researcher was not representing Sementes do Marajó, observation revealed that some seemed to believe that their answers could have implications from the GRO. Furthermore, the American citizenship of the researcher brought forth other limitations. This area has had trouble in the past with an American researcher; therefore, trust and openness took time to achieve. These limitations of positionality were realized in the initial research & pilot study and were mitigated as much as possible during the data collection phase.

Chapter 5: Results

This chapter will take a direct look at the results realized from the data collections methods mentioned above. First, it will show the results related to the influence of the intensification of açai on organizational processes. Then, the influence of Sementes do Marajó concerning the agroecosystem resilience framework will be revealed.

5.1 The Influence of the Intensification of Açai on the Development of Organizational Processes

The intensification of açai has been the result of two circumstances. The first situation was the movement from rural areas to the cities. Maria (2018), one of the original açai sellers, explained that this changed the açai market by increasing the number of processors and sellers. However, she explained this was nothing



compared to the surge that happened a century later. Tunico (2018) claims that the “...international demand of açai changed everything.” This second surge brought the potential of making açai a primary source of income, but it also comes with vulnerabilities (Oliveira, 2018).

In October 1998, two members of a community in the north of the Canaticu River established Cooperativa Mista, who are still the principal leaders of the GRO today. They decided that they could benefit directly from the açai boom that was happening, but they had to establish control to mitigate the effect of being far from a port. The purchase of a boat, the establishment of training programs, and a connection to a buyer in Igapra-Miri brought the stability that was desired by many. Established stability is partially due to being able to find a consistent selling price from a buyer. Their açai is being sold to a company in Castanhal, near the port city of Belém, which ships their açai to the United States. In recent time, Cooperativa Mista has purchased a second boat, works with other communities, and has maintained stability for those involved. Also, Cooperativa Mista holds training on bee-keeping, fish farming, and chicken raising to help with providing food and other sources of income for its members. Additionally, they sell fruit juices to the local school, and they sell local nuts (Jeoval de Matos, 2018).

In communities closer to the city of Curralinho, there was also a desire to have their own autonomy, which they did not believe was possible through joining Cooperativa Mista. Instead, in 2002, Sementes do Marajó began as a solution for communities that were near Curralinho. To ensure a voice for all, Sementes do Marajó developed a plan to have leadership within each community. Each community has a leader, which is meant to represent all the members within the area (Oliveira, 2018). Additionally, Sementes do Marajó has a mission of developing the region sustainably through the collaboration of work between communities and established partnerships. They believe this process includes training members to efficiently manage & harvest açai and to provide organized transportation to deliver the product directly to their buyer; the Municipality of Curralinho. As was seen with Cooperativa Mista, establishing a consistent price with the Municipality of Curralinho, was achieved to bring stability (AMAM, 2017; Oliveira, 2018). Completely, Sementes do Marajó believes that connecting local communities with the Municipality of Curralinho, can achieve long-term sustainability, price stability, and increased health within their region. Beyond their current processes, there is some planning for the future taking place. The leadership of Sementes do Marajó wants to make natural medicinal products from the vast number of products found in the forests, and within home gardens, however, there is currently no plan in place (Oliveira, 2018). Additionally, Leandro (2018) & Isabella (2018) both discussed the fact that there has been training on fish farming as another means of supplying food and as a potential future income source for families. As of June 2018, one training focused around fish farming has occurred.

5.2 Results of the 13 Behavior-Based Indicators

The following section looks directly at the thirteen behavior-based indicators provided by Cabell & Oelofse (2012). In this section, the data is in three separate sub-sections. First, the indicators that did not have an influence from the presence of Sementes do Marajó. Second, the indicators that have some sub-indicators influenced by Sementes do Marajó, while other sub-indicators saw no change. Lastly, the indicators that have each sub-indicator influenced by the presence of Sementes do Marajó.

For further clarification, each sub-heading includes the line, “The Influence of Sementes do Marajó.” There are one of four answers that can follow: *None*, *Positive*, *Negative*, or *Varied*. *None* refers to the claim that Sementes do Marajó does not have an influence on this indicator in any manner. This category also includes cases in which only one or two members have reported a positive or negative change because they are considered outliers. *Positive* refers to cases in which the presence of Sementes do Marajó removes or mitigates the vulnerability in comparison to the base community, Comunidade São Jorge. *Negative* means the influence of Sementes do Marajó results in creating a vulnerability that did not exist in



the base community. *Varied* means the influence of Sementes do Marajó removed or mitigated the vulnerability in one way, yet in another way, it created a vulnerability in Coração de Jesus, the community that works with Sementes do Marajó.

5.2.1 Indicators with No Influence from Sementes do Marajó

5.2.1.1 Optimally Redundant

A) Planting Multiple Varieties of Plants/Crops

The Influence of Sementes do Marajó: None

To be able to compare both communities in this sub-indicator, this research used the agricultural surveys discussed in *Chapter 4*. Based on advice from researchers that have worked with harvesters in areas like Curralinho and the timeframe available, a sample size that results in 90% confidence with a 10% margin of error would be sufficient to compare crop diversity amongst these two communities. All in all, there were thirty-six surveys in Comunidade São Jorge, and thirty-eight surveys in Coração de Jesus completed. The surveys were then organized and analyzed using Menhinick's Diversity Index Formula. A comparison of both results followed. The following begins with Menhinick's Diversity Index formula and the calculations follow.

Menhinick's Diversity Index (Whittaker, 1977):

$D = s/\sqrt{N}$, where s =number of species and N =total individual cases in the study

Comunidade São Jorge:

$$D = 70/\sqrt{657}$$

$$D = 70/25.63201123595259$$

$$D \approx 2.73$$

Coração de Jesus:

$$D = 73/\sqrt{633}$$

$$D = 73/25.15949125081825$$

$$D \approx 2.90$$

Therefore, with 90% confidence and a 10% margin of error, Coração de Jesus has an approximate diversity index of 2.90 and Comunidade São Jorge has an approximate diversity index of 2.73. A triangulation of this information occurred with the interviews & focus groups performed, and the information collected from Sementes do Marajó. Additionally, the surveys revealed that there are thirty-two varieties of fruits, eight varieties of vegetables, and thirty varieties of herbs grown in Comunidade São Jorge. In Coração de Jesus, there were thirty varieties of fruits, eight varieties of vegetables and thirty-five varieties of herbs grown. Despite the higher amount of species richness in Coração de Jesus, this was not the result of Sementes do Marajó.

B) Equipment for Various Crops

The Influence of Sementes do Marajó: None

In both communities, the equipment necessary to process açai is either owned or accessible to families harvesting açai (Lara, 2018; Lorena, 2018; Marla, 2018; Oliveira, 2018; Pablo, 2018; Sidney, 2018). The açai press, pictured in *Image E*, is not necessary for the sale of açai. These presses are meant to process açai at home, so the families that harvest them can enjoy the juice.



The only other equipment needed is the *rasa* or basket that the açai is sold in, which all families have available to them. In each case, transport is readily available, but Sementes do Marajó does have a vessel to pick up the açai. However, this aspect is not considered a benefit to the harvesters of Coração de Jesus within this indicator, because all buyers of açai purchase the berry directly from the harvester's houses (Diego, 2018; Italo, 2018; Pablo, 2018; Sabrina, 2018; Vitor, 2018). No other equipment specific to açai exists within either community. Overall, there was similar equipment found in both communities and the equipment found in Coração de Jesus was not the result of the influence of Sementes do Marajó (FGMCDJ, 2018; FGWCDJ, 2018; Andre, 2018; Fernando, 2018; Diego, 2018; Isabella, 2018).



Image E) Açai Press

C) Nutrients from Various Sources

The Influence of Sementes do Marajó: None

In all the interviews and surveys performed, the individuals surveyed had some type of growing area providing nutrition from their land. Additionally, fruits, vegetables, and herbs arrive from the internal trade networks, more information on these networks is in *Section 5.2.2.1*. This section describes that these networks are ingrained aspects in society, which contribute to providing various sources of nutrients, but they are not a result of Sementes do Marajó. A complete list of the fruits, vegetables, and herbs can be found below in *Table H*.

Table H) All Plants & Trees Cultivated between both Communities

List of All Cultivated Plants & Trees			
<i>Name in Portuguese</i>	<i>Name in English</i>	<i>Scientific Name</i>	<i>Use(s)</i>
Açaí	Açaí	<i>Euterpe oleracea</i> Mart.	Food
Açaí Branco	White Açai	<i>Cultivar</i>	Food
Cupuaçu	N/A	<i>Theobroma grandiflorum</i>	Food
Pequi	Souari Nut	<i>Caryocar Brasiliense</i>	Food
Goiaba	Guava	<i>Psidium guajava</i>	Food/Medicinal
Caçao	Cacao	<i>Theobroma cacao</i>	Food
Limão	Lime	<i>Citrus × limon</i>	Food/Medicinal
Amexia-Amarela	Yellow Plum	<i>Eriobotrya japonica</i>	Food
CastanhodoPara	Brazil Nut	<i>Bertholletia excelsa</i>	Food
Maracuja	Monkeyguzzle	<i>Passiflora coccinea</i> Aubl.	Food/Medicinal
Abobora	Pumpkin	<i>Cucurbita maxima</i> Wall.	Food/Medicinal
Banana	Banana	<i>Musa acuminata</i>	Food
Coco	Coconut	<i>Cocos nucifera</i>	Food
Tangerina	Tangerine	<i>Citrus tangerine</i>	Food
Manga	Mango	<i>Mangifera indica</i>	Food
Bacuri	N/A	<i>Platonia insignis</i>	Food
Arroz	Rice	<i>Oryza sativa</i>	Food
Cajueiro	Cashew	<i>Anacardium occidentale</i>	Food
Genipapo	N/A	<i>Genipa Americana</i>	Food
Laranja	Orange	<i>Citrus X sinensis</i>	Food
Mari	N/A	<i>Cassia leiandra</i>	Food
Taperba	Yellow Mombin	<i>Spondias Mombin</i>	Food
Mamao	Papaya	<i>Carica papaya</i>	Food/Medicinal
Jaca	Jackfruit	<i>Artocarpus heterophyllus</i>	Food
Fruta-do-Conde	Sugar Apple	<i>Annona coriacea</i>	Food
Graviola	Soursop	<i>Annona muricate</i>	Food
Biriba	Wild Sugar-Apple	<i>Rollinia deliciosa</i>	Food



<i>Name in Portuguese</i>	<i>Name in English</i>	<i>Scientific Name</i>	<i>Use(s)</i>
Pupunha	Peach Palm	<i>Bactris gasipaes</i>	Food
Fruta Pao	Bread Fruit	<i>Artocarpus altilis</i>	Food
Acerola	Barbados Cherry	<i>Malpighia emarginata</i>	Food
Tomate	Tomato	<i>Solanum lycopersicum</i>	Food/Medicinal
Abacaxi	Pineapple	<i>Ananas comosus</i>	Food
Melancia	Watermelon	<i>Citrullus lanatus</i>	Food
Pimenta	Pepper	<i>Capsicum sp. L.</i>	Spice
Couve	Cabbage	<i>Brassica oleracea (Cultivar)</i>	Food
Chicória	Chicory	<i>Chichorium intybus L.</i>	Food
Cominha	Cumin	<i>Cuminum cyminum L.</i>	Spice/Medicinal
Milho	Corn	<i>Zea mays L.</i>	Food
Batata-doce	Sweet Potato	<i>Ipomoea batatas Poir.</i>	Food/Medicinal
Mandioca	Cassava	<i>Manihot esculenta</i>	Food
Cebola	Onion	<i>Allium cepa L.</i>	Spice/Medicinal
Alho	Garlic	<i>Allium sativum</i>	Spice/Medicinal
Cebolina	Chive	<i>Allium schoenoprasum</i>	Herb
Salsa	Parsley	<i>Petroselinum sativum</i>	Herb/Medicinal
Trevo roxo	Purple Clover	<i>Oxalis triangularis</i>	Food
Coentro	Coriander	<i>Coriandrum sativum L.</i>	Herb/Medicinal
Jambu	Toothache Plant	<i>Acmella oleracea</i>	Food
Alfavaca	Indian Basil	<i>Ocimum gratissimum L.</i>	Medicinal
Noni	Noni	<i>Morinda citrifolia</i>	Medicinal
Quina	N/A	<i>Strychnos triplinaria</i>	Medicinal
Cidreira	Lemon Balm	<i>Melissa officinalis</i>	Medicinal
Babosa	Aloe	<i>Aloe vera</i>	Medicinal
Hortelãzinho	Mint	<i>Mentha piperita L.</i>	Medicinal
Catinga de mulata	Tansy	<i>Tanacetum vulgare</i>	Medicinal
Laranja da terra	Earth Orange	<i>Citrus aurantium</i>	Medicinal
Pião roxo	Purple Pinion	<i>Jatropha gossypifolia</i>	Medicinal
Folha da goiaba	Leaf of Goiaba	<i>Psidium guajaa</i>	Medicinal
Veronica*	Speedwell	<i>Veronica officinalis</i>	Medicinal
Capim marinho	Lemon Grass	<i>Cymbopogon citratus</i>	Medicinal
Mucuracaá	Guinea Hen Weed	<i>Petiveria alliacea</i>	Medicinal
Algodão	Cotton Tree	<i>Gossypium barbadense</i>	Medicinal
Abacate	Avocado	<i>Persea Americana</i>	Food/Medicinal
Mastruz	Wormseed	<i>Dysphania ambrosioides</i>	Medicinal
Sabugo	Elderberry	<i>Sambucus nigra</i>	Medicinal
Pião branco	Barbados Nut	<i>Jatropha curcas L.</i>	Medicinal
Canela	Cinnamon	<i>Cinnamomum Zeylanicum</i>	Medicinal
Alfazema	Lavendar	<i>Lavandula angustifolia</i>	Medicinal
Arruda	Common Truee	<i>Ruta graveolens L.</i>	Medicinal
Alecrim	Rosemary	<i>Rosmarinus officinali</i>	Medicinal
Boldo	Boldutree	<i>Vernonia sp</i>	Medicinal
Anador	Fresh Cut	<i>Justicia pectoralis Jacq.</i>	Medicinal
Sangue de Cristo	N/A	<i>Sabicea brasiliensis Wernham</i>	Medicinal
Pariri	N/A	<i>Arrabidaea chica</i>	Medicinal
Gengibre	Ginger	<i>Zingiber officinale</i>	Medicinal
Amor crescido	Pink Purslane	<i>Portulaca pilosa</i>	Medicinal
<i>Name in Portuguese</i>	<i>Name in English</i>	<i>Scientific Name</i>	<i>Use(s)</i>
Araçazinho	Strawberry Guava	<i>Psidium cattleyanum</i>	Medicinal
Sucuriçu	N/A	<i>Mikania lindleyana DC.</i>	Medicinal
Cipó Pucá	Climbing Antler	<i>Cissus sicyoides L.</i>	Medicinal
Quebra pedra	Flyroost Leaf-Flower	<i>Phyllanthus corcovadensis</i>	Medicinal
Andiroba	Brazilian Mahoagny	<i>Carapa guianensis</i>	Medicinal

Additionally, many individuals like to catch fish & prawns from the rivers (Pedro, 2018; Victoria, 2018). Similarly, the trade network discussed in *Section 5.2.2.1*, also provides access to fish & prawns (Italo, 2018; Oliva, 2018; Pablo; 2018; Renan; 2018, Vitor; 2018). Olivia (2018) explains that her family does not catch fish or prawns from the river, but her neighbors provide them for her. In return, she gives them varieties of herbs and vegetables that are rare to find in the community. She explains, “We always have enough. If we have more, we give. If we do not have enough, someone will provide for us...” (Olivia,



2018). In this instance, enough is referring to food, which according to Olivia, is always available through some means.

The other source of nutrients is the city of Curralinho. Despite being a significant distance away, both communities have public boat transport available to them daily. It is simple, and relatively cost-efficient, approximately \$2-\$3 USD, to go and come back from the city (Adriano, 2018; Andre; 2018; Daniela, 2018; Fernando, 2018; Felipe, 2018; Marla; 2018). In the city, there are multiple general stores, restaurants, fruit & vegetable stands and a market full of meat, vegetable, fruits, and vegetables.

5.2.1.2 Exposed to Disturbance

A) Selection of Crops based on Experience with Pests

The Influence of Sementes do Marajó: None

The “Matrix Ranking” assessment had the four focus groups rank threats to their plants, which saw pests come in at an average ranking of 3.75/5 in their assessments. In these results, one means the greatest of threats and five meaning it is the least of the threats discussed (FGMCDJ,2018; FGWCDJ,2018; FGMSJ, 2018; FGWSJ, 2018). These results show that pests are not the most significant threat that the communities face, but the mere presence in the ranking assessment proves that it is a top five issues to their crops within the communities. Despite the presence and nuisance of pests, most individuals interviewed did not recognize this as a strategy. Also, in discussion with Oliveira (2018), this was not a strategy implemented by Sementes do Marajó. The word most was used because Felipe (2018) from Comunidade São Jorge, did report making decisions related to pests. Observational data and the wording of the question in this circumstance did raise questions over the legitimacy of this claim. In either case, there was no influence on this indicator from Sementes do Marajó

5.2.1.3 Coupled with Local and Natural Capital

A) Builds Organic Matter

The Influence of Sementes do Marajó: None

Members of the community of Coração de Jesus have been taught a variety of management and production techniques through Sementes do Marajó, which is in Section 5.1.2.3, however ways to build organic matter in the soil is not taught. Building organic matter is also difficult to accomplish because of the swampy areas in which açai thrives (Oliveira, 2018). The only methods that could work would be to find a crop that improves the organic matter of the soil and can handle swampy areas; families could produce their compost or import nutrients into the area. However, neither community claimed to use these techniques.

B) Little Need to Export Waste

The Influence of Sementes do Marajó: None

In both cases, there is little need to export waste from the communities. However, there is waste generated from the açai berry in the form of seeds (Abreu, 2018). The reason there is little need to export waste is that the seeds can be used to plant more trees or left in a pile near the house (Lara, 2018; Laura, 2018; Mateus, 2018; Sabrina, 2018; Vitor, 2018). Near many açai presses, a giant pile of seeds exists. Furthermore, the main reason there is little need to export waste is that the açai found in piles is from açai pressed for home use. When the community sells açai, the purchasers buy it as a whole berry. Therefore, the waste generated from the product is not in the communities. Instead, it is in the final sale location. The Secretary of the Environment, Sandro Abreu (2018), explains “You can see the problem all around our streets [in Curralinho]. The trash cans are full of açai seeds.” Currently, his department is considering



composting or pressing the seeds into charcoal bricks for heat. As of April 2018, neither plan has moved forward.

5.2.1.4 Spatial and Temporal Heterogeneity

A) Mosaic Pattern of Managed and Unmanaged Land

The Influence of Sementes do Marajó: None

In both communities, there are large patches of managed and unmanaged land. Despite these large patches of unmanaged land, açai is an abundant part of the natural landscape. Therefore, these patches do exist; however, the açai palm connects throughout the land in both communities. The management strategies taught by Sementes do Marajó to Coração de Jesus do not attempt to create gaps between the palms in the area (Oliveira, 2018).

B) Diverse Cultivation Practices

The Influence of Sementes do Marajó: None

In the case of both Coração de Jesus and Comunidade São Jorge, the method of cultivation is the same (Oliveira, 2018). There are different “secrets” that members pass through the generations (Italo, 2018; Helena, 2018), but generally, the methods are found to be the same amongst community members. The methods taught to the community by researchers brought in by Sementes do Marajó are only on management and not on the cultivation aspects of açai (Oliveira, 2018).

5.2.2 Indicators with Mixed Influences from Sementes do Marajó

5.2.2.1 Socially Self-Organized

A) Shared Work Across Families

The Influence of Sementes do Marajó: None

In both communities, there was almost a complete agreement that families work together to help each other with the planting of crops. In Coração de Jesus, one participant and in Comunidade São Jorge two participants stated this did not exist (Felipe, 2018; Lorena, 2018; Luiz, 2018). One of the participants in Comunidade São Jorge reported that “the community does not work together at all,” which contradicts the number of other individuals that claimed this to be true (Felipe, 2018). Most of all participants agreed that work across families existed. Carly (2018) explained that this mainly happens during the management phase as harvesting is a job of the kids and is a fast process. Mariana (2018) confirmed this statement by saying, “I tell my child to go get some açai and they come back in less than ten minutes.” The actual management process requires more work and the communities tend to find working as a group can make management easier and more enjoyable experience (Adriano, 2018; Andre, 2018; Camila, 2018; Carly, 2018; Daniel, 2018; Daniela, 2018; Victoria, 2018; Vitor, 2018). Most of the other participants mentioned the assistance of other families in the processing and selling of açai (Aline, 2018; Barbara, 2018; Jessica, 2018; Julia, 2018; Luana, 2018; Pedro, 2018; Rodrigo, 2018).

B) Internal Trade Networks

The Influence of Sementes do Marajó: None

In both communities, an internal trade network exists exclusively around food. Once again, all but three individuals agreed that there was a trade network within the community. Those that disagreed were the same individuals that said there was not shared work across communities (Felipe, 2018; Lorena, 2018; Luiz, 2018). According to the interviews, the most common items traded amongst families were vegetables and fruits. The second most common items that individuals trade are fish & prawns. These



internal trade networks are not necessarily direct trades. In other words, two individuals are not coming together with items and agreeing on a set amount that creates an equal trade. Instead, when someone has an abundance of an item, they will give it to other families. Later, the receiving families will be the one with an abundance of an item, and they will it share it with other families too (Adriano, 2018; Jean, 2018; Lorena, 2018; Lara, 2018; Mariana, 2018; Rafael, 2018; Victor, 2018; Victoria, 2018). Therefore, it is not necessarily a formal trading market that exists; instead, it is a sharing network that exists in both communities.

There are also one or two individuals in both communities that provide a plethora of medicinal plants & trees to other community members. Livia (2018) said, “I enjoy being the person that others can rely on for their health...nearly everyone in the community comes to me.” To get a better understanding of all the medicinal plants & trees that are grown, distributed, and used, a list of medicinal plants & trees provided in the agricultural surveys were compared against academic sources to comprise a list of these various medicinal resources.

Table 1) Medicinal Plants & Trees and Their Uses Found in Communities

Medicinal Plants & Trees and Their Uses Found in the Communities					
<i>Name in Portuguese</i>	<i>Name in English</i>	<i>Scientific Name</i>	<i>Use</i>	<i>Local Medicinal Use</i>	<i>Academic Confirmation</i>
Goiaba	Guava	<i>Psidium guajava</i>	Food/Medicinal	Wound healing	(Di Stasi, L. et al., 2001)
Limão	Lime	<i>Citrus × limon</i>	Food/Medicinal	Colds	(Di Stasi, L. et al., 2001)
Amexia-Amarela	Yellow Plum	<i>Eriobotrya japonica</i>	Food/Medicinal	Headaches, stomach ache and diarrhea	(Di Stasi, L. et al., 2001)
Maracuja	Monkey-guzzle	<i>Passiflora coccinea</i> Aubl.	Food/Medicinal	Sedative and for asthma symptoms	(Di Stasi, L. et al., 2001)
Abobora	Pumpkin	<i>Cucurbita maxima</i> Wall.	Food/Medicinal	Parasitic worms	(Di Stasi, L. et al., 2001)
Mamao	Papaya	<i>Carica papaya</i>	Food/Medicinal	Cold	(Di Stasi, L. et al., 2001)
Tomate	Tomato	<i>Solanum lycopersicum</i>	Food/Medicinal	Prostate concerns	(Di Stasi, L. et al., 2001)
Batata-doce	Sweet Potato	<i>Ipomoea batatas</i> Poir.	Food/Medicinal	Mouth infections	(Di Stasi, L. et al., 2001)
Cominha	Cumin	<i>Cuminum cyminum</i> L.	Spice/Medicinal	Fever and Menstrual Pains	(Herbal Resource, 2018)
Cebola	Onion	<i>Allium cepa</i> L.	Spice/Medicinal	Parasitic worms	(Di Stasi, L. et al., 2001)
Alho	Garlic	<i>Allium sativum</i>	Spice/Medicinal	Hypertension, colds and bronchitis	(Di Stasi, L. et al., 2001)
Salsa	Parsley	<i>Petroselinum sativum</i>	Herb/Medicinal	Renal disturbances (kidney Infections)	(Di Stasi, L. et al., 2001)
Coentro	Coriander	<i>Coriandrum sativum</i> L.	Herb/Medicinal	Headaches and migraines	(Di Stasi, L. et al., 2001)
Alfavaca	Indian Basil	<i>Ocimum gratissimum</i> L.	Medicinal	Diarrhea, stomachache and a sedative for children	(Di Stasi, L. et al., 2001)
Noni	Noni	<i>Morinda citrifolia</i>	Medicinal	Impotence of men and menstrual cramps	(Dixon, et al., 1997)
Quina	N/A	<i>Strychnos triplinaria</i>	Medicinal	General pain and fever	(Di Stasi, L. et al., 2001)
Cidreira	Lemon Balm	<i>Melissa officinalis</i>	Medicinal	Sedative and relaxation, cold, cough and bronchitis	(Di Stasi, L. et al., 2001)
Babosa	Aloe	<i>Aloe vera</i>	Medicinal	Anti-inflammatory, wound healing, and burns	(Di Stasi, L. et al., 2001)
Hortelãzinho	Mint	<i>Mentha piperita</i> L.	Medicinal	Diarrhea, parasitic worms, stomachache and a relaxer & sedative	(Di Stasi, L. et al., 2001)
Catinga de mulata	Tansy	<i>Tanacetum vulgare</i>	Medicinal	Lice, fleas and scabies	(Schinella, G. et al., 2011)
Laranja da terra	Earth Orange	<i>Citrus aurantium</i>	Medicinal	Calming, anti-bacterial and an anti-inflammatory	(Cisneros, G. & Yeny, K., 2014)
Piãõ roxo	Purple Pinion	<i>Jatropha gossypifolia</i>	Medicinal	Diabetes, stomach pains, hemorrhoids, hypertension and peptic ulcers	(Herbal Resource, 2018)
Folha da goiaba	Leaf of Guava	<i>Psidium guajava</i>	Medicinal	Stomach ache, diarrhea and hemorrhoids	(Di Stasi, L. et al., 2001)
Veronica	Speedwell	<i>Veronica officinalis</i>	Medicinal	Anti-inflammatory	(Riley, D., 1995)
Capim marinho	Lemon Grass	<i>Cymbopogon citratus</i>	Medicinal	Calming, sedative, blood pressure and an anti-fungal	(Herbal Resource, 2018)
Mucuracaá	Guinea Hen Weed	<i>Petiveria alliacea</i>	Medicinal	Anti-inflammatory, anti-bacterial and to enhance the immune system	(Kim, S., Kubec, R. & Musah, R., 2006)
Algodão	Cotton Tree	<i>Gossypium barbadense</i>	Medicinal	Muscle pains and headaches	(Di Stasi, L. et al., 2001)
Folha do Abacate	Avocado Leaves	<i>Persea Americana</i>	Medicinal	Diarrhea, bloating and flatulence	(Herbal Resource, 2018)



<i>Name in Portuguese</i>	<i>Name in English</i>	<i>Scientific Name</i>	<i>Use</i>	<i>Local Medicinal Use</i>	<i>Academic Confirmation</i>
Mastruz	Wormseed	<i>Dysphania ambrosioides</i>	Medicinal	Parasitic worms	(Avila-Blanco, et al., 2014)
Sabugo	Elderberry	<i>Sambucus nigra</i>	Medicinal	Cold/Flu relief, sinus infections, lowers blood sugar, diuretic, laxative and to ease allergies	(Herbal Resource, 2018)
Piãõ branco	Barbados Nut	<i>Jatropha curcas L.</i>	Medicinal	Wound healing	(Gubitz, G., Mittelbach, M. & Trabi, M., 1999)
Canela	Cinnamon	<i>Cinnamomum Zeylanicum</i>	Medicinal	Aids with yeast infections, diabetes, lowers cholesterol, anti-fungal, anti-bacterial, common cold, flu and headaches	(Herbal Resource, 2018)
Alfazema	Lavender	<i>Lavandula angustifolia</i>	Medicinal	Sedative, fungal infections, eczema, ulcers, sunburnt skin and acne	(Di Stasi, L. et al., 2001)
Arruda	Common True	<i>Ruta graveolens L.</i>	Medicinal	Diarrhea, headache, fever, cough and general pain	(Di Stasi, L. et al., 2001)
Alecrim	Rosemary	<i>Rosmarinus officinali</i>	Medicinal	Sedative, analgesic, aids with hypertension and fights constipation	(Di Stasi, L. et al., 2001)
Boldo	Bold tree	<i>Vernonia sp</i>	Medicinal	Stomach-hepatic complaints, stomach ache, nausea, gastritis and bad digestion	(Di Stasi, L. et al., 2001)
Anador	Fresh Cut	<i>Justicia pectoralis Jacq.</i>	Medicinal	Muscle relaxant and general pain	(Almedia et al., 2017)
Sangue de Cristo	N/A	<i>Sabicea brasiliensis Wernham</i>	Medicinal	Fever, vomiting, insomnia and to combat venereal diseases	(Batista, J. et al., 2014)
Pariri	N/A	<i>Arrabidaea chica</i>	Medicinal	Anti-inflammatory, anti-bacterial, diabetes, diarrhea, hemorrhoids, uterus inflammation and pain and as an anti-ulcer	(Carlotto dos Santos, V. et al., 2012)
Gengibre	Ginger	<i>Zingiber officinale</i>	Medicinal	Stomach ache and digestion issues	(Di Stasi, L. et al., 2001)
Amor crescido	Pink Purslane	<i>Portulaca pilosa</i>	Medicinal	Fever, anti-inflammatory, sedative, diarrhea, and dysentery	(Rocha, M. et al., 1994)
Sucuriju	N/A	<i>Mikania lindleyana DC.</i>	Medicinal	Dermatosis, inflammation and chronic gastric ulcers	(Vanderlinde, F. et al., 2012)
Cipó Pucá	Climbing Antler	<i>Cissus sicyoides L.</i>	Medicinal	Hypertension and heart-related diseases	(Viana, G. et al., 2004)
Quebra pedra	Fly roost Leaf-Flower	<i>Phyllanthus corcovadensis</i>	Medicinal	Diuretic and stomach pain	(Di Stasi, L. et al., 2001)
Andiroba	Brazilian Mahogany	<i>Carapa guianensis</i>	Medicinal	Arthritis, rashes, muscle and joint aches and injuries, wounds, boils and herpes ulcers	(Penido, C. et al., 2006)

C) Cooperative Selling Areas

The Influence of Sementes do Marajó: None

Despite the presence of this indicator in the “No Influence” results section, both communities have two different situations. In Comunidade São Jorge, there is no cooperative selling area. There are two locations near the beginning of the community—the mouth of the river—that sell products. These are not a community store; management is a task of individual households (Rafael, 2018; Victor, 2018; Victoria, 2018). In Coração de Jesus, there are two different areas that the community shares to sell products. The first is a port, which has existed for a least a decade, where a multitude of families from various communities come to sell products. The second is a communal area within the community itself. This area allows the community to sell açaí at one port. Both areas distinguish this community from Comunidade São Jorge; however, they were developed independently and are not from the influence of Sementes do Marajó (Andre, 2018; Oliveira, 2018).

D) Decision-Making Autonomy

The Influence of Sementes do Marajó: Varied

In Comunidade São Jorge, everyone involved in the açaí trade relies directly on the atravessadores to deliver his or her product to the market. Additionally, there was acknowledgement that this influences their ability to make decisions. Despite this acknowledgment, the Focus Group of Women in Comunidade São Jorge (2018) discussed that despite knowing that Sementes do Marajó would provide a voice for themselves, they did not trust that this would be entirely true because of their involvement with the government. In confirmation, Ester (2018) said, “They do not work, [and] there is corruption in the



offices. How can there be trust?” She is explaining that if they act in this manner within their positions, then what would be different with Sementes do Marajó?

In Coração de Jesus, the Focus Group of Men in Coração de Jesus (2018), explained that working as one unit allows for more voice from the group and it helps them secure more longevity for these reasons (FGMCDJ, 2018). Individual interviews revealed similar findings. Leandro (2018) explained that the group dynamic benefits everyone together. He highlighted the fact that himself and others could connect with essential figures within the process. In his opinion, there are not an extensive amount of people in the Municipality of Curralinho, but these connections have allowed him to get to know government officials and others that influence policies surrounding açai. The representation of voice as a result of the presence of Sementes do Marajó is a claim of various men in Coração de Jesus (Andre, 2018; Diego, 2018; Fernando, 2018; Marcos, 2018; Sidney, 2018)

The Focus Group of Women in Coração de Jesus (2018) discussed the topic of voice as well. They all agreed that they were present within meetings, but there was a lack of listening to their opinions. The individual interviews revealed a similar finding that many women feel as if Sementes do Marajó is not representative of their voice (Helena, 2018; Lorena, 2018; Marla, 2018; Sofia, 2018). Marla (2018) explained that “I feel like I speak, but nobody actually listens.” They also noted that only the initial meeting and one class had taken place in the years of involvement with Sementes do Marajó.

5.2.2.2 Functional and Response Diversity

A) Various Types of Growing Areas

The Influence of Sementes do Marajó: None

In both communities, there are various types of growing areas. A checklist developed based on the work of Steward (2013) was utilized to provide a basis of understanding. She highlighted seven different types of growing areas located in the community she studied. She titled these areas: mature tidal forests, managed açai forests, young unmanaged agricultural fallows, old unmanaged agricultural fallow, managed fallows, home gardens, and annual fields. These types of areas do not exist in every household, however, throughout both communities, every type of area exists. The variety of areas found existed before the presence of Sementes do Marajó (Oliveria, 2018; Andre, 2018).

B) Multiple Sources of Income

The Influence of Sementes do Marajó: Varied Influence

In both communities, there are a variety of income sources. The most common sources of income for the communities comes from açai, the legal & illegal sale of timber, cassava, fish & shrimp, and retirement. Oliveira (2018) explains that timber is still the most consistently lucrative trade, but açai is very close. Felipe (2018) explains that he was heavily involved in the timber trade, but the amount of work that exists around it, the limited availability, and the relatively close amount of profit that it generates, led to him leaving the illegal timber industry to work solely with açai. Similarly, Andre (2018) explained that moving from the timber trade, became much more feasible because of the stabilization and increased income from Sementes do Marajó. Now, he can concentrate on the income that comes from the palm. He continues to discuss the fact that the management methods taught to him through Sementes do Marajó have allowed him



Image F) Cut Palm Trees for Palm Heart Extraction

to generate income from two aspects of the palm tree. Andre (2018) states, “My family harvests the açai, but eventually the trees stop producing. Then as we clean the area for management, we cut these trees, and we harvest the palm hearts.” The palm hearts are then sold to a company down the river, providing a second source of income for families (Andre, 2018; Oliveira, 2018).

Secondary income that these communities generate comes from small shops, like the one discussed in Comunidade São Jorge, where the owner purchases items from Curralinho to sell it at a higher price within the community (Rodrigo, 2018). Also, some individuals sell fruits & vegetables within the community; however, all mentioned that this only happens on occasion. These sales happen at the port located near Coração de Jesus (Sidney, 2018; Andre, 2018). The Focus Group of Women in Comunidade São Jorge (2018) and the Focus Group of Women in Coração de Jesus (2018) discussed that they would be pleased to be able to sell the diverse amount of fruits, vegetables, and herbs that they are growing, but there is not a market available for them. This sentiment was heard from various interviews of women within the communities (Helena, 2018; Livia, 2018; Lorena, 2018; Sofia, 2018; Victoria, 2018).

5.2.2.3 Ecologically Self-Organized

A) A Habitat for All

The Influence of Sementes do Marajó: None

In both cases, similar effects to the environment exist. Observational data revealed that the timber trade is having a continuous impact on the local environment. This impact can be seen in the removal of different species and gaps of land. Two individuals heavily involved in the timber trade said that many species have disappeared due to overharvesting (Pedro, 2018; Jean, 2018). Congruently, when looking at the measurement of species diversity in the area, one of the main aspects observed is species evenness. In the case of both communities, a significantly large amount of açai was present in comparison to the other trees in the area. The other negative impacts have come from the development of annual fields and the increased production of other fruit trees. Also, there have been no classes/training directly related to maintaining a diverse habitat provided by Sementes do Marajó (Oliveira, 2018).

B) Understanding the Limits of Production

The Influence of Sementes do Marajó: Positive

In Coração de Jesus, special management classes were provided by research students from the Federal Rural University of Amazonia for the members of Sementes do Marajó. They were taught proper ways to manage açai forests, including when it is proper to remove older species that are no longer beneficial (Oliveira, 2018). This knowledge exists in all the members involved with Sementes do Marajó. Management practices are taught outside of the community as well. For instance, Mateus (2018), which is in Comunidade São Jorge, explained that he attended management classes in Curralinho. These classes taught him a variety of practices that included proper management of these forests. The existence of other training displays that despite not all members of the communities attending, there are other sources of information available. However, from discussions with Mateus (2018), he explained, “The classes were focused around management and not on maintaining the environment.”

5.2.2.4 Appropriately Connected

A) Crops Interplanted into Polycultures

The Influence of Sementes do Marajó: None

In both communities, interplanting crops is a practice within the multiple types of land areas discussed in Section 5.1.1.2. Daniela (2018), explained that this is something that has been passed down from older generations in this community. Similarly, an elder in the community explains that interplanting has been an essential practice that has always been a part of their farming systems. She stated, “We have always



produced all of our foods, and my parents taught me from the time I was young that planting multiple types of crops together is good for the soil, maintaining crops, and eating a great meal,” Laura (2018).

B) Sell to Multiple Types of Buyers

The Influence of Sementes do Marajó: Positive

In Comunidade São Jorge, two main types of *atravessadores* go through the area. The *atravessadores* can either come from Currálinho or from other areas looking to transport the product. According to the *atravessadores*, the most common vessels used to transport goods can carry approximately 500 rasas or about 7,000 kg of açai. The larger vessels or those that are purchasing from the communities to deliver to the larger port areas or factories can carry approximately 4000 rasas or 56,000 kg of açai. Both vessels are found traveling through Comunidade São Jorge and Coração de Jesus. In the high season for açai, both will come through the area daily, but in the low season, only the *atravessadores* from Currálinho will come every day.



Image G) Small Vessel for Transport of Goods

In addition to these transporters, the community of Coração de Jesus has two additional opportunities throughout the week to sell to Sementes do Marajó (Oliveira, 2018). These purchases provide a third buyer in this community. Also, the added connection of a buyer of palm hearts and the knowledge taught of how to harvest these palms correctly, provides another buyer for Coração de Jesus. The only downside to this current access to transportation is the quality of the vessel. According to Oliveira (2018), the vessel itself has become very old, and there is a need to repair or replace it to maintain this transportation. At the time of the research, Sementes do Marajó was seeking funds through an internet-based campaign. As of July 31st, the campaign has reached 9% of the total goal (Benefeitoria, 2018).

5.2.2.5 Reflective and Shared Learning

A) Connection between Universities, Research, and Farmers

The Influence of Sementes do Marajó: Positive

As discussed, the first training class provided by Sementes do Marajó was bringing in a group of research students from the Federal Rural University of Amazonia to teach about maximizing production in a sustainable way (Oliveira, 2018). This training was available to those that had joined Sementes do Marajó. The training taught skills that would not have been present otherwise. Italo (2018) of Coração de Jesus explains that this class was beneficial in understanding not only how to get the most yield of açai fruits, but also ways to get the most out of each palm tree to provide an alternative income source. Italo (2018) states further, “These trainings taught us that we already own enough land.” He is referring to the fact that despite the limitations on land, the training brought forth methods to gain more yield out of the land they already possess. Other members of the community, confirmed this same feeling from the training (Andre, 2018; Kelvin, 2018; Marla, 2018; Sofia, 2018). In both communities, there are connections to the universities and other farmers through familial and friend connections. A direct connection to research is a benefit brought through the presence of Sementes do Marajó (Andre, 2018; Italo, 2018; Kelvin, 2018; Marla, 2018; Oliveira, 2018; Pablo, 2018; Sofia, 2018).



B) Knowledge Sharing between Farmers

The Influence of Sementes do Marajó: None

In both communities, there is collaboration in work amongst farmers as discussed before. However, through the interviews that took place, this is the only time that farmers share knowledge amongst each other. Mateus (2018) explains that it is typical for discussions over farming only to take place when they work. These conversations do not take place in more formal meetings, such as the times the community comes together to discuss other issues (Andre, 2018; Adriano, 2018; Daniel, 2018; Jessica, 2018; Renan, 2018).

C) Record Keeping

The Influence of Sementes do Marajó: None

In nearly all the interviews that took place and through direct observation, no individuals reported or were seen keeping track of the amount of açaí harvested or sold. In four cases, there was mentioning of keeping mental track over these items (Italo, 2018; Lorena, 2018; Pablo, 2018; Renan, 2018). Renan (2018) explained, "I can tell you how much I have sold for each of the last five years." This comment displays signs of understanding the importance of record keeping, but it does not seem that keeping trackable records is of key importance amongst community members. The one interview not accounted for until this point mentioned records. Leandro (2018) explained that Sementes do Marajó has taught him about keeping records of the amount that he is producing and selling. He emphasizes this point by saying, "The only way I can know how much I have sold is by writing it down. This helps me make decisions in the future" (Leandro, 2018). The fact that only one member claims this skill leaves this result to be considered no influence from Sementes do Marajó.

D) Knowledge about the State of the Agroecosystem

The Influence of Sementes do Marajó: None

In both communities, there was inductive data that brings forth the idea that there was knowledge over slight changes in the agroecosystem and the importance of preserving the nature around them. However, whenever the question about their agroecosystem was asked directly to participants, not a single participant claimed to know how their agroecosystem was currently performing. The only contradictory information available is that in the research student classes, there were aspects that directly related to talking about the ecosystem and its association with açaí in a general fashion (Oliveira, 2018; Andre, 2018). There has not been a direct assessment of their agroecosystem before this research.

5.2.2.6 Honors Legacy

A) Engagement of Elders Knowledge

The Influence of Sementes do Marajó: None

In the interview process, there were three elders interviewed. In all three cases, it is a claim that there was not the community-wide engagement of the knowledge that they possessed surrounding agricultural decision-making and planning (Sofia, 2018; Isabella, 2018; Rafael, 2018). Still, this does not mean that engagement does not happen in these areas. In seven of the interviews, there was mentioning of gaining knowledge through parents, grandparents, and great-grandparents (Diego, 2018; Helena, 2018; Isabella, 2018; Luiz, 2018; Marina, 2018; Mateus, 2018; Victoria, 2018). The transfer of knowledge through generations shows that there is engagement with the knowledge of elders, however not necessarily as a community-wide approach. There is also no aspect of Sementes do Marajó that directly seeks this knowledge in a former manner (Oliveira, 2018).



B) Maintenance of Heirloom Seeds

The Influence of Sementes do Marajó: None

In both communities, there seemed to be an emphasis on using heirloom seeds. In both cases, it came second to utilizing modern, engineered seeds that can produce more yield. In discussions with both communities, the benefits of using engineered seeds provided a great benefit to them, and these seeds would be utilized first if they were available (Andre, 2018; FGMCDJ, 2018; FGWCDJ, 2018; FGMSJ, 2018; FGWSJ, 2018; Felipe, 2018; Isabella, 2018; Mateus, 2018; Victoria, 2018). Sementes do Marajó has not promoted the use of heirloom seeds at this time (Oliveira, 2018).

5.2.2.7 Builds Human Capital

A) Investment in Infrastructure and Institutions for Education

The Influence of Sementes do Marajó: None

In the case of Comunidade São Jorge, the profits gained were staying directly within the families. Some of these funds would be used in benefiting their infrastructure or for education for their children; however, there was not a group investment happening into community-wide infrastructure or for institutions of education (FGMSJ, 2018; FGWSJ, 2018). In Coração de Jesus, there have been community-wide investments in the past and present, but none have been towards education or developed from Sementes do Marajó (FGMCDJ, 2018; FGWCDJ, 2018).

B) Support for Social Events in Farming Communities

The Influence of Sementes do Marajó: Positive

Sementes do Marajó has brought the Festival of Açaí to Currálinho. This festival is a weekend-long event that celebrates a good açaí harvest each year. The celebration brings in approximately 15,000 people from communities all around Currálinho and surrounding municipalities. There is also a claim that 10,000 liters of açaí will be consumed during this event each year (Movimento Marajó Forte, 2013). Oliveira (2018) explains that this event is a huge day of celebration for everyone. Even the minority of individuals that do not make money from açaí have a chance to celebrate the fruit that gives them the energy to work. For those that harvest or make açaí through other means, it is a celebration of both the health and the wealth that this fruit has brought to them (Andre, 2018; Leandro, 2018; Oliveira, 2018).

C) Programs for Preservation of Local Knowledge

The Influence of Sementes do Marajó: None

In both communities, there is a heavy presence of engaging with local knowledge. This engagement exists in the information provided in *Section 5.1.2.4*, regarding the connection to and the utilization of the knowledge of elders. Still, there are no formal programs developed for the preservation of this knowledge in either community (Leandro, 2018; Marcos, 2018; Oliveira, 2018; Pedro, 2018).

5.2.3 Indicators with Complete Influence from Sementes do Marajó

5.2.3.1 Globally Autonomous and Locally Interdependent

A) Selling to a Local Market

The Influence of Sementes do Marajó: Positive

In both communities, cassava, timber, and açaí are sold within the local market (Adriano, 2018; Jean, 2018; Lorena, 2018; Lara, 2018; Mariana, 2018; Rafael, 2018; Victor, 2018; Victoria, 2018). Regarding açaí, when being sold to the *atravessadores* there is not a guarantee that the product will stay in the local market. Sometimes it goes to Currálinho, but it could also move to the larger port cities, for export



(Atravessadores, 2018). The berries sold through Sementes do Marajó in Coração de Jesus, are being transported directly to the Municipality in Curalinho. Although these harvesters are still selling some of their açaí globally, two days a week, there is a guarantee that the açaí is being sold and consumed locally. Also, the palm hearts in Coração de Jesus, are being sold to regional buyers, but some of the product does go to the international market (Giovani, 2018; Oliveira, 2018).

B) Relationship Between Producer and Consumer

The Influence of Sementes do Marajó: Positive

Similarly, to the last sub-indicator, if selling directly to the atravessadores there is no direct knowledge of who the consumer will be in the end. However, Sementes do Marajó selling directly to the local government, provides a relationship between the producer and consumer (Oliveira, 2018). This relationship was apparent when a local government official was in Coração de Jesus when the study took place. The individuals involved in Sementes do Marajó, all seemed to have a connection to the official when he was in the community. However, the overall relationship and viewpoints of the government are not favorable. In various interviews, several points were made discussing a lack of trust



Image H) Protest Over the Governments Work Habits

with the government. The main points were around the absence of focus & work being performed by governmental officials and the corruption of the government (FGWCDJ, 2018; FGWCSJ, 2018; Livia, 2008; Daniela, 2008; Laura, 2018). This feeling could be seen within Curalinho as well. While performing research in Curalinho, a protest was taking place over the dedication of government officials. A picture of the protest is in *Image H*. This indicator is looking directly at the relationship existing, and therefore Sementes do Marajó has had a positive influence this manner. However, the fact that there was a significant number of women making this claim makes it noteworthy for future discussion.

5.2.3.2 Reasonably Profitable

A) Earn a livable wage

The Influence of Sementes do Marajó: Positive

This indicator was explored in the focus groups more thoroughly, due to the sensitive nature of the conversation. In all four focus groups, there were claims that the increased demand of açaí alone could bring the communities to a comfortable wage, but they all were earning a livable wage before the increase (FGMCDJ, 2018; FGWCDJ, 2018; FGMSJ, 2018; FGWSJ, 2018). The difference lies in the stabilization of these wages. In Comunidade São Jorge, the instability of the açaí market is very impactful to the wages and requires careful planning, especially in the case where families rely purely on açaí for their incomes (FGMSJ, 2018; FGWSJ, 2018) In contrast, those involved with Sementes do Marajó in Coração de Jesus, were experiencing much more stabilization with their incomes. Also, there is a higher quality requirement brought by Sementes do Marajó that bring an extra profit at sale. The extra profit is significant considering that all harvesters will have higher quality açaí in their harvests. However, only those involved with Sementes do Marajó will receive an increased profit (Diego, 2018; Isabella, 2018; Jean, 2018; FGMCDJ, 2018; FGWCDJ, 2018; Sabrina, 2018).



B) Reliance on Governmental Assistance*The Influence of Sementes do Marajó: Negative*

The increased purchase price and stability is a result of the connection to the Municipality of Curralinho, which is a part of the government. In this way, they are receiving government assistance. The question then remains, are individuals relying on it directly? The answer depends on the individual. The Focus Group of Men in Coração de Jesus (2018) & the Focus Group of Women in Coração de Jesus (2018) discussed how the stabilization helps with long-term investments and to provide a more luxurious life than presently exists. These claims infer that the increased income acts more as a benefit than a necessity. However, many individuals left other areas of work because of the increased profits and decided to focus directly on açai (Andre, 2018; Felipe, 2018; Marla, 2018; Pablo, 2018; Renan, 2018).

Additionally, the whole basis of Sementes do Marajó is on this partnership and there is no other plan currently in place (Oliveira, 2018). Although members would still have an outlet to sell açai, this would ultimately affect other vulnerabilities that Sementes do Marajó has mitigated. Based on this notion, this is considered a negative influence from Sementes do Marajó since the functioning of the GRO relies directly on government assistance.

Chapter 6: Discussion

In this chapter, the influence of the intensification of açai on the development of organizational processes, a reflection of the organizational processes against the literature, and the influence of Sementes do Marajó on the agroecosystem resilience of Coração de Jesus will all be discussed. The discussion of all these topics will eventually lead to the conclusion, *Chapter 7*, where an answer for the central research question waits.

6.1 The Influence of the Intensification of Açai on the Development of Organizational Processes

In review, the intensification of açai comes from the need or desire to focus more directly on açai and the practice of increasing the yield of açai while minimizing inputs. The intensification of açai came in two waves; the first being when community members started moving to the cities and the second being when açai became an internationally desired crop. The second wave was very impactful, as the increased demand provided the opportunity to make much more profit from açai harvesting (Brondizo et al., 2002; Pegler, 2015). Therefore, the intensification of açai was a mutually shared desire of the communities that harvest açai and those that desire it as a superfood. However, for some, the intensification of açai was more than the desired path; it fulfilled a need. As explained, the natural & governmental restrictions on the timber-trade influenced many communities. These restrictions created a time when communities were seeking a new means to sustain their livelihoods. Other crops would provide some relief, but they did not have the high-profit potential of açai, and the inequalities associated with land access left the most impoverished with trying to find a solution utilizing their existing assets (Pegler, 2015). Açai had the potential to not only fulfill the desire of many seeking its high profitability, but it also could provide a solution for the most impoverished communities.

However, as explained in *Section 2.1.4*, the intensification of açai, exacerbated the issues of a lack of decision-making autonomy and the fragility & nature of açai, while also developing another vulnerability for açai harvesters; the limitation on maximizing production (Brondizo, et al., 2002; Lewis, 2008; Cordeiro de Santana et al., 2015; Pegler, 2015). The solution in two separate regions within Curralinho was to develop GROs that could mitigate these vulnerabilities that existed (Jeoval de Matos, 2018; Oliveira, 2018). Therefore, both Cooperativa Mista and Sementes do Marajó established themselves because the intensification of açai had exacerbated existing vulnerabilities and developed a new issue for communities. Also, they both developed their organizational processes directly around the main issues



they were facing in the communities; the three vulnerabilities experienced across the region. Overall, the intensification of açai influenced the development of organizational processes because members of the community believed that they needed to work together to solve the issues that it either exacerbated or created. The next section will expand on this thought by comparing the organizational processes against the vulnerabilities that exist and the factors of a successful GRO.

6.2 The Organizational Processes in Comparison to Existing Vulnerabilities and the Factors of a Successful GRO

Cooperativa Mista and Sementes do Marajó are both GROs that have the intent of gaining control over decisions around the transportation and the sale of açai. This section will consider how the organizational processes of each GRO reflect against the main vulnerabilities of açai and the factors that govern the potential success of a GRO. This section is not about the influence of these GROs, but about how the developed processes, in theory, reflect against the current literature that exists. The actual influence of the processes of Sementes do Marajó on agroecosystem resilience will be addressed in *Section 6.3*.

In the development of organizational processes, both Cooperativa Mista and Sementes do Marajó utilized a similar approach in the areas of an establishment of transportation and a buyer (Jeoval de Matos, 2018; Oliveira, 2018). The establishment of control of these facets was vital in the development of each GRO because two of the main vulnerabilities that açai harvesting communities face are a long distance from buyers and the instability of the price of açai. Each believed that by controlling transportation and establishing a buyer, they could minimize the consequences of the vulnerabilities on themselves their communities (Brondizo et al., 2002; Lewis, 2008; Pegler, 2015).

The main variance between the case of Cooperativa Mista and Sementes do Marajó is the distance in which the product must travel to reach their buyer. Cooperativa Mista developed a connection to an international exporter which is over six hours in total distance from their community (Jeoval de Matos, 2018). Sementes do Marajó established a local connection, which is an average of two hours away from the communities in which they harvest (Oliveira, 2018). The distance in each case is essential as both Cooperativa Mista, and Sementes do Marajó are relying on their transportation to bring their product to the buyers (Jeoval de Matos, 2018; Oliveira, 2018). Transportation is also an essential aspect because of the vulnerability of the fragility & general nature of the açai fruit (Brondizo et al., 2002; Lewis, 2008; Cordeiro de Santana et al., 2015; Pegler, 2015). Considering both aspects together, the longer distance that Cooperativa Mista must travel creates a potential issue if something were to happen to their means of transportation, mainly because açai must be processed in a fast timeframe (Brondizo et al., 2002; Pegler, 2015). Contrary, if Sementes do Marajó were to experience their transportation issues, there are many means of transportation obtainable to them in an emergency. Other transportation is available because their buyer is in the city of Curralinho, which has an abundant number of vessels going through the Canaticu River daily.

In either case, the formation of a means of transport, establishing a buyer, and bringing in members of the community focuses around establishing control over decisions (Jeoval de Matos, 2018; Oliveira, 2018). Throughout this thesis, this is called decision-making autonomy. As hinted in the previous section, the buyers of each GRO are dissimilar. Cooperativa Mista connects directly to an international exporter of açai and Sementes do Marajó sells directly to the Municipality of Curralinho (Jeoval de Matos, 2018; Oliveira, 2018). In each case, the decision of whom to sell to displays an area of control. The variance exists in the fact that Cooperativa Mista has only gained control over arguably half of the process. Jeoval de Matos (2018) explains that they bring the product to the market, and then it is sold to a factory in



Castanhal, Pará, Brazil. Despite the work of Cooperativa Mista finishing there, the factory still processes the açaí, exports the product, and then it is packaged & sold. In the case of Sementes do Marajó, they sell it directly to the Municipality of Curralinho, which still does distribute açaí amongst their offices and the local schools, but the value chain is much shorter. The literature explains that with each additional step in the value chain, there is a more significant potential for the voice and security of the producing communities to be minimized (Pegler, 2015). Despite these differences, the buyers established by both Cooperativa Mista and Sementes do Marajó have the potential of providing more stability to the volatile price of açaí on the open market since they have both gained control over more steps within the value chain. Also, both established a consistent purchase price from their buyer, which provides price stability (Pegler, 2015; Jeoval de Matos, 2018; Oliveira, 2018).

Another critical aspect of decision-making autonomy is providing a voice to the community members. Each focused on establishing this idea, with two different approaches. Cooperativa Mista was established by two community members, and they have maintained leadership within the organization (Jeoval de Matos, 2018). Sementes do Marajó, has shifted the overall leadership and has recognized community leaders within the area (Oliveira, 2018). Concisely, Sementes do Marajó uses a variety of leaders on a hierarchical scale, while Cooperativa Mista opted for a monarchical-like approach. The literature explains that these choices can both either be successful or not, depending on a variety of factors. In both cases, Boehm & Staples (2015) explain that there must be a clear path for the members of a GRO to follow. Baral (2013) adds that fewer individuals in leadership can more easily establish a clear path, but that the effective implementation of multiple-leaders can result in a more fruitful GRO. This potential is because GRO management is complicated, and when each leader has one specific task, the division of labor allows for efficiency and an increased focus on individual aspects. Beyond the goals and the path, the desire of representation also should gain consideration due to its relevance in the success of a GRO, and because it is a desire of both communities (Jeoval de Matos, 2018; Oliveira, 2018). As Vadjunec et al. (2011) said, the communities in the Amazon region are full of a wide diversity of individuals and opinions. Sementes do Marajó utilizes a representative of each community, which can help increase the voice of these diverse individuals. The idea of representing the voices of all coincides with the thought presented by Bettencourt et al. (1996) that there is a substantial need to establish *group identity* to have a successful GRO. They are referring to the fact that individual members desire to feel as if they are a valued member of the group.

The other main process that was developed focused on attaining a higher level of production while minimizing inputs, or more specifically the implementation of açaí intensification methods. Shanley et al. (2002) discussed the fact that this can transpire by harvesting more of the wild fruit or by increasing the production of the crop itself. The literature explained that land accessibility due to restrictions placed by the government, the high price of land and inequalities, mainly around gender and the most impoverished, make accessing additional land progressively tricky for many in the communities (Deere, 2003; Sauer & Leite, 2011; Medina, et al., 2015). Altering these aspects would necessitate multi-faceted changes, as the factors that control these limitations stretch beyond the local scale. However, intensification methods can also take place with the existing land of families. In Cooperativa Mista and Sementes do Marajó, the development of training programs existed to help in these areas. In both programs, sustainable management of açaí to increase production was considered the emphasis of the training. In the case of Cooperativa Mista, the leaders went through training, and then they taught the community members (Jeoval de Matos, 2018). Sementes do Marajó utilized research students from the Federal Rural University of Amazonia to provide training programs to each community to learn proper management and full utilization of the tree (Oliveira, 2018). Medina et al. (2015), explained that each area is so diverse that specified training is necessary amongst the communities. However, the training was focused on



management, but not necessarily on skills related to record keeping and business & financial management. Morsello (2006) found that many times companies will successfully help with financial gain, which the training provided by each cooperative have the potential to do, but they do not leave communities in a place to be utterly autonomous because they lack training related to business management.

Overall, this section is looking at the intention of both Cooperativa Mista, and Sementes do Marajó and the development of their organizational processes. The next section will look at the results of the agroecosystem resilience study of Sementes do Marajó. These results will display not only the influence Sementes do Marajó has had on the agroecosystem resilience of a community, but also the influence that this GRO has had on the main vulnerabilities of açai.

6.3 Influence on Agroecosystem Resilience from Sementes do Marajó

In the assessment of the influence of Sementes do Marajó, there was a reduction or alleviation of six vulnerabilities, the addition of a vulnerability that did not previously exist, and varied results in two sub-indicators or potential vulnerabilities. This section will discuss the results found against the literature, to gain a greater understanding of not only how Sementes do Marajó is influencing these indicators, but also on the potential implications this has on the communities themselves. Due to the overlap of some of the indicators, categorization has brought them together. In these cases, the sub-indicators are in a list below the section title.

6.3.1 Positive Influence

6.3.1.1 Influence on Production Methods

Sub-Indicators: Understanding the Limits of Production and Connection between Universities, Researchers & Farmers

In review, Lewis (2008) & Pegler (2015) were the only academics to focus directly on the influence outsiders can have on a community focused around açai. Lewis (2008) found that through various outlets, there was a push towards large-scale, mono-cropped agriculture. This shift was not the case in Coração de Jesus. Sementes do Marajó, and the university students that were brought into to teach management classes were not teaching production on a large scale. Additionally, they were not teaching ways to increase the number of açai trees in the area. The focus was on management to maximize production & to understand the limits of production (Mateus, 2018; Oliveira, 2018). The focus of these trainings is important because maximizing yield is amongst the limitations that exist with the region (Brondizo et al., 2002; Lewis, 2008; Cordeiro de Santana et al., 2015; Pegler, 2015). The approach that research students taught provides a method of increasing yield, that does not require expanding the quantity of land that is owned by community members and having access to technological advances that many communities in this region lack. The latter point was highlighted as a significant vulnerability for many açai harvesting communities (Medina et al., 2015). Also, it does not contribute to the inequalities found in Boa Vista, in which only the wealthy were able to maximize yield due to their ability to purchase upland areas for production (Lewis, 2008).

Another difference between Boa Vista and Coração de Jesus is the focus on methods to intensify açai through experts in the field. Lewis (2008) explained that the outside influences in Boa Vista were government officials, businesses involved with other fruits, and community leaders. Although these individuals have extensive knowledge in a variety of fields, they do not necessarily understand or focus directly on practices that benefit açai production. Instead, in Coração de Jesus and the other communities that Sementes do Marajó works alongside, the research students that provided the training, were researchers of açai (Oliveira, 2018). The effectiveness of this approach is confirmed by Morsello (2006),



who has seen a positive economic and environmental influence from organizations that work with individuals/groups that are considered experts on an NTFP. The methodology utilized by Sementes do Marajó is to use the traditional knowledge of the area, while also incorporating techniques found to be useful in more recent times. This mixture of methods was a product of utilizing local researchers of açai that have experience with the traditional methods of management found in the region (Oliveira, 2018). These mixed methods can also positively influence *Group Identity & Cohesion*. Bettencourt et al., (1996) explain that making members feel as if they are a part of something and they belong is crucial for the success of a GRO. By utilizing a combination of traditional approaches & modern methods, the knowledge that is possessed by members already can help them feel as if the methodology used by their families for generations, is a part of the solution.

6.3.1.2 The Sale of Açai

Sub-Indicators: Sell to Multiple Types of Buyers, Selling to a Local Market and Earn a livable wage

Belcher and Schreckenber (2007) and Pegler (2015) discussed the long path that exists between the harvester and the marketplace, known as a value chain. In the case of selling to the *atravessadores*, there are many individuals in the value chain and the price of açai is determined by the regional and international market price at the time of sale (Atravessadores, 2018). Contrary, Sementes do Marajó is selling directly to the municipality, at a fixed price and a higher rate (Oliveira, 2018). In *Section 6.1*, this is brought in as a potential benefit, and the results have confirmed that this is happening today.

Similarly, the literature heavily discussed the price fluctuations and seasonality of açai (Brondizo et al., 2002; Lewis, 2008; Cordeiro de Santana et al., 2015; Pegler, 2015). Oliveira (2018), explained that Sementes do Marajó brings this stability to the harvesters. This economic advantage can be considered a benefit brought by the membership of Sementes do Marajó. Bettencourt et al. (1996), explained that benefits derived from being a part of a GRO could assist in establishing *Group Morale & Motivation*. This increased morale was present in an interview with, Helena (2018), who explained that this one of the reasons she appreciates Sementes do Marajó. She states that Sementes do Marajó, "...allows me to trust that I will have an income that I can use to feed my family today and to save for future times when açai is not available to sell" (Helena, 2018).

6.3.1.3 Festival of Açai

Sub-Indicator: Support for Social Events in Farming Communities

In this context, the indicator provided by Cabell & Oelofse (2012) seeks to understand how the influence of Sementes do Marajó on a community "...takes advantage of and builds 'resources that can be mobilized through social relationships and membership in social networks.'" In this case, the sub-indicator is looking at social events as a platform to build social relationships and networks. Bettencourt et al. (1996) clarify this same phenomenon as building *Group Identity & Cohesion*. These types of events not only are a time for members to come together, but it is also a time to be proud of the accomplishments they have achieved as a GRO. The "Festival of Açai" does precisely this for the members, but also for everyone in Curalinho and its surrounding municipalities (Oliveira, 2018). It is a time of celebration, but also a time of connection, where networking can happen in the area. In this way, it works towards building potential budding relationships to help bring a stronger local structure. Also, a time of celebration works to build the energy of the members of Sementes do Marajó. This increased energy was explained as *Group Motivation & Morale* (Bettencourt et al., 1996). As described, this is a time for the members of Sementes do Marajó to be proud of everything they have accomplished, which builds motivation & morale across the members, for their work in the future.



6.3.2 Negative Influence

6.3.2.1 Reliance on Governmental Assistance

In the processes of Sementes do Marajó, the government is bringing price stabilization to the açai market. This stabilization is critical because many researchers have explained the fact that this is a significant vulnerability associated with açai (Brondizo et al., 2002; Lewis, 2008; Pegler, 2015; Cordeiro de Santana et al., 2015). Dawe (2001) explains that stabilizing prices helps to protect poor consumers and farmers from the sharp fluctuations in prices that exist due to the influence of the local and global market. However, stabilization comes at a considerable cost to the government. The idea of studying resilience is focused around the idea that the world around us is dynamic. Change is inevitable, especially in complex governmental systems. Therefore, this stabilization is helpful, but it also brings back old vulnerabilities if this stabilization disappears. According to research on resilience, there is never a guarantee that something that exists today, will also be available tomorrow. Therefore, it is important to have flexibility and alternative plans (Lin, 2011; Liao, 2012). Furthermore, Oliveira (2018) also made this same claim that he does not know how long the connection of Sementes do Marajó and the Municipality of Curralinho will last; yet, no other plan exists.

This lack of plan displays the absence of long-term rational. This gap in thinking was discussed by Boehm & Staples (2005) by saying that every decision made by leadership should have a focus on the sustainability of the GRO. Also, since there is a lack of trust towards the Municipality of Curralinho, this shows that the concept of *Group Identity & Cohesion* is not entirely fulfilled (Bettencourt et al., 2005). Additionally, the heavy reliance on help from the municipality can have a negative influence on *Group Identity & Cohesion* and *Group Motivation & Morale*. Bettencourt et al. (1996), explain that a large part of group identity is that members feel as if they can accomplish their goals on their own. Ultimately, the reliance on government assistance, especially when there is a lack of trust, can result in a loss of motivation and morale.

6.3.3 Varied Influence

6.3.3.1 Multiple Sources of Income

This indicator is considered both a positive and negative influence of Sementes do Marajó. The açai harvesters in Sementes do Marajó have had training on harvesting the palm hearts from the açai palm trees. This becomes another income resource for açai farmers, utilizing the old trees through this management practice. This training diversified their sources of income and maximized the benefits of the tree (Felipe, 2018; Oliveira, 2018).

However, as stated by Morsello (2006), the sole reliance on a product will not bring a community out of poverty. In the case of assessing agroecosystem resilience, it can also increase the vulnerability of communities. Adger (2000) explains that developing a dependency on highly profitable crops is easy to do since a high profit is guaranteed in the present. Similarly, Steward (2013) explains that with an increased focus and eroding biodiversity, communities can start to experience economic loss and social implications. Boehm & Staples (2005) would describe this as a lack of long-term planning. The results did reveal that there are plans to diversify sales to other crops; mainly through medicinal products. This potential plan coincides with the desire of the Focus Group of Women in Coração de Jesus (2018), when they mentioned that they wish they could make profits from the wide variety of crops that already exist within their gardens.

In confirmation, the data revealed that in Coração de Jesus, there were thirty varieties of fruits, eight varieties of vegetables, and thirty-five varieties of herbs. This list only includes the actual items planted and not everything that is available in the forests around them. Livia (2018) said, “We have so many



things in our forests that can be used as medicine, but we aren't selling them to others." The main reason is that there is not a connection to sell these items in a market. Oliveira (2018) confirmed that Sementes do Marajó wants to move towards other items, but this process also involves finding a buyer that is willing to purchase them. Despite the struggle that exists, it is apparent that there is a desire to sell items and an immense amount of supply available.

In the same line of thought, Sementes do Marajó has provided açai management training through university students to its members (Oliveira, 2018). However, there has only been one training directly on fish farming, that community members could attend. Leandro (2018) explains, "I really learned a lot from the training..." but continues to explain "...I still have a lot to learn about fish farming and I would like to have more training." The researcher then asked if he would be interested in learning other skills such as beekeeping or chicken farming. He replied, "I would be willing to have a training in anything that was available. I love to learn." Training outside of açai, particularly in the fields of fish farming, chicken farming, and beekeeping, is a large part of the operation of Cooperativa Mista (Jeoval de Matos, 2018). The fact that they hold this training is brought into this discussion because it shows that there is knowledge in the area that surrounds the communities of Sementes do Marajó and that a multi-crop GRO focus is feasible.

6.3.3.2 Decision Making Autonomy

In the creation of Sementes do Marajó, a primary goal in establishing a GRO was to provide decision-making autonomy (Oliveira, 2018). Uphoff (1993) explains that this coincides with the path of others that have established GROs before them. The pure establishment of a GRO should not provoke the assumption that it automatically represents the voice of the members.

The results displayed that the men that belong to Sementes do Marajó, perceive that they have decision-making autonomy through a strong voice and developed relationships. The meaning of a strong voice is in the concept of *Intragroup Coordination & Communication*. In this case, the GRO allows for all voices to be heard and considered in the process of decision-making. Likewise, the developed relationships described by the men, contributes to *Group Identity & Cohesion* within the group (Bettencourt et al., 1996). However, many women have a different perspective. The Focus Group of Women in Coração de Jesus (2018) discussed that they were present in the meetings, but they did not feel that their thoughts truly mattered. These findings contradict the same two concepts discussed above. Regarding the concept of *Intragroup Coordination & Communication* provided by Bettencourt et al. (1996), if the voice of women is not being considered then not all the voices are being used to make decisions regarding Sementes do Marajó. Since this aspect finds its basis in perceptions, leadership or other members could argue that this is not the case. However, a claim that goes without a possible argument is the concept of *Group Identity & Cohesion*. In this concept, the perception is enough to lead to the failure of a GRO, since they do not feel as if they are a part of the group's decisions (Bettencourt et al., 1996).

The second aspect brought up by the women was that there has only been the initial meeting and one training class that took place in the last few years (FGWCDJ, 2018). In further examination, this does not mean that nobody within Sementes do Marajó has met, yet this is the result of having a community leader/attending the meetings on their behalf (Oliveira, 2018). Baral (2013) explains that having multiple leaders can be beneficial to a GRO if this means that they are a representative of those they are meant to represent. In this case, community meetings are not happening with the members, which means that the voice of members is limited (FGWCDJ, 2018). Although the men reported different perceptions, the literature does



not state that only half of the voices are needed to have a successful GRO. This claim was emphasized by Pegler (2015), by explaining that many organizations fail due to not including all the voices.

In addition to the perceptions of individuals, a supplementary item that needs to gain attention is the vessel which provides decision-making autonomy. This vessel still exists; however, the old conditions of the vessel discovered in the research process bring concern. Boehm & Staples (2005) add that one of the most critical aspects of a leader of GRO is to create a sustainable plan. The basis of believing that a robust plan was not in place is that fund-raising began before this research took place, yet, the internet-based fund-raising effort has not progressed in the four months that have passed since the data collection started. Today, the fundraising effort has achieved less than 9% of its total goal (Benfeitoria, 2018). A sustainable plan would allow for a GRO to maintain stability as discussed in resilience-based research (Liao, 2012). However, in this case, a thorough plan was not implemented, and now Sementes do Marajó may face the repercussions.

Chapter 7: Conclusion

The influence of the intensification of açai on agroecosystem resilience within the communities of Curralinho varies based on the acceptance of a GRO or not. The communities that accepted the influence of Sementes do Marajó had six indicators that had a positive influence, one that had a negative influence, and two with mixed influences from the processes of Sementes do Marajó. These indicators reflect potential vulnerabilities, which the Collins Dictionary (2018) describes as the ease in which something can be affected. Therefore, the positive influence from Sementes do Marajó results in six areas that are now less likely to be affected by an external or internal force.

The negative influence on *Reliance on Government Assistance* has created an area in which the member communities could be affected in the future, but this does not mean that non-member communities do not face this same vulnerability. This vulnerability was created by trying to fix the reliance on the *atravessadores* that was exacerbated by the intensification of açai. Therefore, non-member communities may not have the same level of reliance on the Municipality of Curralinho, but they are still reliant on others to transport & sell their açai and the global demand of açai. Additionally, the influence of Sementes do Marajó had mixed results on *Decision-Making Autonomy* because the men experienced differences than the women, there are a lack of meetings, and their means of having decision-making autonomy was at risk. First, the fact that men had more of a voice represents an inequality, but the equality that exists for non-member communities is no voice at all. Second, the lack of meetings is still more than what happens in non-member communities. Third, the fact that there is even a vessel is an excellent upgrade for many of the families in non-member communities that do not possess a boat in the first place. Likewise, Sementes do Marajó positively influenced the other indicator of *Multiple Sources of Income* because of providing training on how to harvest the palm hearts, but a negative influence because there was a lack of training and focus of the GRO on other sources of income. As seen in the other categories, there was not a palm heart harvesting training for non-member communities, and the issue of a lack of diversity in sales is an issue in both communities.

Overall, the intensification of açai has influenced the agroecosystem resilience of communities through the exacerbation of previous vulnerabilities and the creation of new ones. The initiation of GROs in response to the vulnerabilities that exist has at the very least helped to mitigate a lot of the vulnerabilities that are in non-member communities. There are still many areas for improvement that should be made to reach a higher level of agroecosystem resilience. However, if Sementes do Marajó, Cooperativa Mista, and newly forming GROs consider the aspects discussed in the literature review, results, and discussion;



then açai harvesting communities in Curralinho, Pará, Brazil that accept the help of GROs, could thrive in stable situations and maintain stability in the event of an external threat to their livelihoods.

7.1 Future Research

First, this research faced issues of access, which resulted in only gaining information on the development & organizational processes of Cooperativa Mista. If access exists in the future, new insight could add to the results of this research and provide new data on the impact that GROs have on agroecosystem resilience within this context. Second, as will be recommended to the communities and Sementes do Marajó, performing this same research after some time has passed could provide insight into how time has influenced agroecosystem resilience in these communities. Lastly, a theme of gender inequality emerged in this research. Due to the focus of this study, only a small part of this research discussed this topic. Based on a review of the previous literature surrounding açai, the topic of gender inequality has received little focus. Therefore, looking directly at this subject in the future should be done.

7.2 Recommendations for Curralinho

This thesis provided insight into the influence of the intensification of açai on the agroecosystem resilience of communities in Curralinho, Pará, Brazil. In the case of the communities, this information can provide a basis for understanding the current state of each respective agroecosystem. Additionally, this research could provide a basis for long-term planning in the communities. Also, the agroecosystem is continuously changing, especially if changes occur in the community, so performing this same assessment after time has passed can help to understand the amount of influence that implemented changes have had on agroecosystem resilience.

Sementes do Marajó, the GRO is moving in the right direction; however, this research did reveal insight into the current influence, and this information should gain consideration in future planning. A thorough review of the findings may not provide immediate solutions, but the implementation of this work into planning meetings can help to maximize the influence of the GRO. As stated in the recommendations for communities, the agroecosystem and the influence that Sementes do Marajó is having will be in a constant state of change. Therefore, using this framework after some time has passed can provide insight into how changes are influencing agroecosystem resilience within the communities of Sementes do Marajó.

7.3 Final Words

Finally, these recommendations bring the conversation back to the title of this thesis. Açai has been a gift to the local people for centuries as a reliable food source. More recently, the traits that make it a superfood have caught the attention of many around the world. This could not have happened at a better time as the timber-trade was dwindling and restrictions came into place. Of course, many social, economic, and environmental implications make açai a complex gift. However, açai has the potential to increase the profits and to secure the livelihoods for others, but this thesis revealed that it should not be the only solution and it is challenging to reap the benefits alone. GROs have the potential to be a part of the solution, but results of the agroecosystem resilience framework and the literature that exists around what it takes to be a successful GRO need to be a part of the planning process. If present & future bottom-up approaches follow these steps, then GROs could be a solution to nature's complex gift.



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Appendix

A) In-Depth Interview Guide

Introduction and Consent:

The research that is being conducted aims to understand the influence of Sementes do Marajó on communities in this area. To do so, the same questions are being asked to both the communities of Coração de Jesus and Comunidade São Jorge. More specifically, the questions will help to understand how each community will be able to handle changes to market prices, the climate in the area, or other factors that may affect this area in the future. My main interest in conducting this interview is to learn more about how grassroots organizations influence communities.

I am currently a student at Utrecht University in the Netherlands. This research will be used to develop my master's thesis, in the field of International Development. Everything you tell me will be only used for writing this thesis and I will not reveal any information that you tell me during the time I am here in Curralinho. However, in September, I will release my final paper to both communities and to Sementes do Marajó, in addition to being available on the internet to the public, so that everyone can gain knowledge from the data I collect. In the final paper, your name will be anonymous, meaning no one will know that you are the one that gave the answers. I will change everyone's names, to fully protect you. This protection means that you can feel very comfortable to answer the questions truthfully, as no repercussions should occur. The more truthful the answers, the more everyone involved will benefit.

If you are okay with everything that I have said, will you sign this consent form? In addition, would it be okay if I record this interview for the sake of being able to review your answers later?

Background Information:

What is your age?

What is the name of your community?

Have you always lived in this area?

Do you currently sell açaí?

Are you a member of Sementes do Marajó?

Opening Questions: First, I am curious about you and your community.

If at all, how do you and other families in the community work together?

Probe: How often? Certain individuals?

If at all, how do you determine if you will sell or trade extra fruits and vegetables harvested amongst community members?

Probe: How often? Certain individuals?

If at all, how have you and your community developed areas to sell items together?



Probe: Who participates? Are their rules?

How do you think you and your community are connected to universities, research that exists and other farmers outside of your community?

Probe: How connected? How often is this used?

If at all, how do you and other farmers share information between each other?

Probe: Are there formal setups? How often should this happen?

How do you know what you have planted and sold in the past?

Probe: How did you learn? How can this help in the future?

How much do you know about the status of the environment around you?

Probe: The economy around you? The life of people around you?

Main questions: Now we are going to move to questions that are more directly related to the influence you and your community are having in the world around you.

If at all, how have you and your community invested into the infrastructure and institutions for educating yourselves and others?

Probe: How important is this to you?

If at all, how has your community supported social events?

Probe: How often do they happen? Will you please describe the type of people that attend?

If at all, how have programs been developed to help preserve local knowledge?

Probe: How important is this to you? How is the information distributed?

How does your community collect and use information from elders?

Probe: How often is it used? How is this information collected for future generations?

Will you please describe the different places and ways items are sold from your community?

Probe: How often do individuals sell to multiple types of buyers?

How do you know the different individuals your community is selling to?

Probe: How well connected are you to them? How are they chosen?

Who are the different people that your community sells to?

Probe: How long have these connections existed?

Will you please describe the different sources of income within your community?

Probe: How have these changed through time?

Can you describe the waste that is generated from your community?

Probe: Where does it go? What happens if it stays in the community? How is it moved out of the area?



Transition: The next questions will be more directly related to your communities' engagement with the natural environment around you.

How does your community work towards maintaining a habitat good for all plants, animals, and humans around you?

Probe: How does planning for this take place? How often is it assessed?

Where does all the food for your community come from?

Probe: How has this changed through time?

How does your community understand the limits of what can be produced?

Probe: How is this assessed? How were the limits established?

Will you please describe the different types of areas that plants/trees are grown in the area?

Probe: Which of these items were taught from elders? Through other means? What are the other means?

Will you please describe the different ways in which you and your community cultivate crops?

Probe: How long have these methods been utilized? Who taught these methods?

If at all, how does your community plant different crops in the same area?

Probe: Who taught these methods to your community? Why is this done?

If at all, how do you and your community select crops based on experience with pests in your area?

Probe: How do community members discuss these items? What types of crops are no longer planted?

If at all, how does your community create gaps of similar types of crops in an area?

Probe: Why does this happen?

If at all, how do your planting methods influence the organic matter of the soil?

Probe: How does this work? Where and who taught these methods?

Will you please describe the various types of equipment in your community?

Probe: Who provided this equipment?

How does your community maintain heirloom seeds in your community?

Probe: Why is this important to the community? How are the seed species selected?

Closing Questions

The following questions are focused around understanding your individual decision-making in joining or not joining the organization

Will you please describe what is the most important aspect for an organization bring to you?

Probe: How has past experience influenced this opinion?

Will you please describe what is the most important thing an organization can avoid doing?

Probe: How has past experience influenced this opinion?



How do you think Sementes do Marajó has or has not delivered these items to communities?

Probe: How have you come to this conclusion?

If you had control of the organization, what would you do differently?

Probe: How have you voiced these opinions? How is your opinion sought?

The End

-Remind them that they have been very helpful to your research and that you will maintain anonymity in the research paper to protect any of the responses that they gave

-Thank them once again

B) Focus-Group Guide

Introduction:

The research that is being conducted aims to understand the influence of Sementes do Marajó on communities in this area. To do so, the same questions are being asked to both the communities of Coração de Jesus and Comunidade São Jorge. More specifically, the questions will help to understand how each community will be able to handle changes to market prices, the climate in the area, or other factors that may affect this area in the future. My main interest in conducting this interview is to learn more about how organizations influence communities.

I am currently a student at Utrecht University in the Netherlands. This research will be used to develop my Master's Thesis, in the field of International Development. Everything you tell me will be only used for writing this thesis and I will not reveal any information that you tell me during the time I am here in Curralinho. However, in September, I will release my final paper to both communities and to Sementes do Marajó, in addition to being available on the internet to the public, so that everyone can gain knowledge from the data I collect. In the final paper, your name will be anonymous, meaning no one will know that you are the one that gave the answers. I will change everyone's names, to fully protect you. This protection means that you can feel very comfortable to answer the questions truthfully, as no repercussions should occur. The more truthful the answers, the more everyone involved will benefit.

If you agree, will you please sign this consent form? In addition, is everyone okay with me recording this conversation and with me taking notes during the process?

Broad Opening Question

How does your community work together as a group?

Probes: How does this happen with work to be done? How does your community share equipment? If your community has established a trade market, how does it work? Has your community established an area for everyone to sell together? How does your community share knowledge amongst each other? How is knowledge from the elders utilized?

Specific Questions

How does your community consider the environment in decisions being made?



Probes: How does this consider the habitat of plants, animals, and people? How do you know the limits of production in the area? How are the plants cultivated around each other? Are there different cultivation practices used? How is planting location decided (are the crops connected or are there gaps)? How are the different types of planting areas considered? How is an understanding of the environment assessed/considered? How is waste in the community removed or handled?

Various types of nutrients

How are decisions around the types of crops utilized decided in the community?

Probes: Are the crops chosen based on pests? If at all, how are records maintained within the community?

How are the buyers of your products decided?

Probes: How are relationships established and maintained with these buyers? How are relationships established and maintained with the consumers? How has the influence or not of the organization supported a livable wage for the community? How much reliance on governmental assistance exists? Where does income for the communities come from?

How has your community invested and maintained knowledge into the community?

Probes: Has money been invested into infrastructure or institutions for education? Has your community supported any social events? Has your community established any connections between universities, researchers, or farmers? How much control do you think your community has over the decisions being made?

How has your community decided to work with the organization or not?

Probes: How has the organization helped individuals/communities? How has the organization not helped individuals/communities?

Matrix Rankings

1) What is the largest threat to the success of being able to produce crops in your area?

Threats to Plants					
Option	1	2	3	4	5
1					
2					
3					
4					
5					

Final Ranking:

- 1)
- 2)
- 3)
- 4)
- 5)

2) What is the actual influence of the organization?

Actual Influence of the Organization					
Option	1	2	3	4	5
1					
2					
3					
4					
5					

Final Ranking:

- 1)
- 2)
- 3)
- 4)
- 5)

3) What do you desire the greatest influence of the organization to be?

Desired Influence of the Organization					
Option	1	2	3	4	5
1					
2					
3					



4					
5					

Final Ranking:

- 1)
- 2)
- 3)
- 4)
- 5)

Closing Question

If you as a group could control the organization, how would you do things differently?

Post-Discussion Questions and End

-This completes our questions for you today. Do you have any questions for us?

-Thank you and future contact

C) List of Focus Group Participants

Focus Group	Anonymized Names	Date
Coração de Jesus: Men	Junior	4/20/2018
Coração de Jesus: Men	Luca	4/20/2018
Coração de Jesus: Men	Jonathan	4/20/2018
Coração de Jesus: Men	Raul	4/20/2018
Coração de Jesus: Men	Christian	4/20/2018
Coração de Jesus: Men	Davi	4/20/2018
Coração de Jesus: Women	Yumi	4/20/2018
Coração de Jesus: Women	Emily	4/20/2018
Coração de Jesus: Women	Gabi	4/20/2018
Coração de Jesus: Women	Viviane	4/20/2018
Coração de Jesus: Women	Clara	4/20/2018
Coração de Jesus: Women	Heloisa	4/20/2018
Comunidade São Jorge: Men	Hugo	4/17/2018
Comunidade São Jorge: Men	Jean	4/17/2018
Comunidade São Jorge: Men	Josue	4/17/2018
Comunidade São Jorge: Men	Pablo	4/17/2018
Comunidade São Jorge: Men	Breno	4/17/2018
Comunidade São Jorge: Women	Babi	4/18/2018
Comunidade São Jorge: Women	Ester	4/18/2018
Comunidade São Jorge: Women	Marcia	4/18/2018



Comunidade São Jorge: Women	Giovana	4/18/2018
Comunidade São Jorge: Women	Paola	4/18/2018
Comunidade São Jorge: Women	Carol	4/18/2018
Comunidade São Jorge: Women	Camilia	4/18/2018

D) List of In-Depth Interview Participants

Participant Number	Anonymized Name	Gender	Community
1	Pedro	M	Comunidade São Jorge
2	Felipe	M	Comunidade São Jorge
3	Mariana	F	Comunidade São Jorge
4	Camila	F	Comunidade São Jorge
5	Julia	F	Comunidade São Jorge
6	Mateus	M	Comunidade São Jorge
7	Laura	F	Comunidade São Jorge
8	Jessica	F	Comunidade São Jorge
9	Daniel	M	Comunidade São Jorge
10	Luiz	M	Comunidade São Jorge
11	Rafael	M	Comunidade São Jorge
12	Victor	M	Comunidade São Jorge
13	Luana	F	Comunidade São Jorge
14	Barbara	F	Comunidade São Jorge
15	Vitor	M	Comunidade São Jorge
16	Aline	F	Comunidade São Jorge
17	Livia	F	Comunidade São Jorge
18	Daniela	F	Comunidade São Jorge
19	Victoria	F	Comunidade São Jorge
20	Rodrigo	M	Comunidade São Jorge
21	Marcos	M	Coração de Jesus
22	Leandro	M	Coração de Jesus
23	Helena	F	Coração de Jesus
24	Sabrina	F	Coração de Jesus
25	Carly	F	Coração de Jesus
26	Diego	M	Coração de Jesus
27	Marla	F	Coração de Jesus
28	Fernando	M	Coração de Jesus
29	Isabella	F	Coração de Jesus
30	Italo	M	Coração de Jesus
31	Lorena	F	Coração de Jesus
32	Andre	M	Coração de Jesus
33	Lara	F	Coração de Jesus
34	Sofia	F	Coração de Jesus



35	Adriano	M	Coração de Jesus
36	Sidney	M	Coração de Jesus
37	Pablo	M	Coração de Jesus
38	Kelvin	M	Coração de Jesus
39	Jean	M	Coração de Jesus
40	Renan	M	Coração de Jesus

E) Code Book from Analysis

Family	Code
Socially Self-Organized	Families Sharing Work
	Internal Trade Networks
	Shared Selling Areas
	Development of Organization
	Decision-Making Autonomy
Ecologically Self-Regulated	Management of Forests
	Practiced Forest Management Practices
Appropriately Connected	Crops interplanted in polycultures
	Sell to multiple type of buyers
Functional and Response Diversity	Various types of growing areas
	Diversity of inputs
	Diversity of outputs
	Multiple income sources
Optimally Redundant	Planting multiple varieties of trees/crops
	Equipment for various crops
	Nutrients from various sources
Spatial and temporal heterogeneity	Mosaic pattern of managed and unmanaged land
	Diverse cultivation practices
	Crop rotation
Exposed to disturbance	Selection of crops based on pests
	Selection of plants based on controlled invasion
	Experience in changes of demand
Coupled with local and natural capital	Builds organic matter
	Little need to import nutrients



	Little need to export waste
Reflective and shared learning	Connection between universities, research, and farmers
	Knowledge sharing between farmers
	Record keeping
	Knowledge about the state of the agroecosystem
Globally autonomous and locally interdependent	Selling to local market
	Relationship between producer and consumer
	Shared local resources
Honors Legacy	Engagement of Elders knowledge
	Incorporation of traditional cultivation techniques with modern knowledge
	Maintenance of heirloom seeds
Builds Human Capital	Investment in infrastructure and institutions for education of children and adults
	Support for social events in farming communities
	Programs for preservation of local knowledge
Reasonably Profitable	Additional income from açai
	Less reliance on Bolsa Familia and other social-welfare programs
	Reliance on subsidies
Gender and Jobs	Positions held by gender
	Positions held by age
Motivation for work	Financial motivation to work
	Job choice
Organizational Involvement	Internal motivation to join an organization
	Experience with other organizations

