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## Article

# A Multi-Methodological Analysis of Jabuticaba's Supply Chain in an Agricultural Cooperative Production

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**Abstract:** *Background:* In the late 1990s, the idea of fighting drought gave way to the concept of how to live with drought in the Brazilian semi-arid region. From this perspective, the Brazilian Federal Government's investment in social technology and education encouraged local agricultural production and subsistence agriculture began to have a surplus for commercialization and income generation. However, there are still difficulties in the development of the productive chain, as perceived in Alagoas, Brazil, with the jabuticaba fruit and its derivatives. In this locus, problems related to the creation of value and distributions of the product were identified. *Methods:* This study proposed a participant observation in a rural producers' association and a multimethodological approach based on VFT (Value-Focused Thinking) and SWOT analysis aiming to structure the problem, identify communities' objectives and develop alternatives to solve these problems so that they can get more out of their production. *Results:* showed that the product has marketing potential due to its differential, but the producers are limited in the process of distributing the goods. *Conclusions:* So, this study was able to analyze the problems of this productive system in a structured way, generating suggestions for actions to achieve the strategic objectives of the cooperative.

**Keywords:** supply chain; structuring problem; family farming; multimethodology



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## 1. Introduction

Balancing environmental sustainability with economic and social growth is a challenge for current and future generations. The high consumption rates of the world population, along with population growth, have driven the production of various industrialized products in recent decades. However, at the same level, a chain based on conscious food consumption has grown through a sustainable production system [1].

For [2], agriculture and the food systems it supports are at a crossroads. Despite recent technological advances in food production, almost one-third of food produced for human consumption, equivalent to a total of 1.3 billion tons, is lost during the production process up to the food processing stage or wasted at the food service and consumer level [3].

Given this scenario, there is a need to discuss sustainability and supply chain management practices [4]. Sustainable supply chain management (SSCM) refers to the management of resources within a company and the collaboration of members along the supply chain, taking into account the three dimensions of sustainable development that are required from customers and other stakeholders [5].

Brazil is one of the world's leading food producers and an important supplier of commodities to the global market [6]. However, the sector has high levels of food waste, with Brazil being among the top ten food-wasting countries in the world [7]. This demonstrates the importance of the theme and the need to analyze this chain.

The semi-arid region of Brazil is the one with the highest rainfall index in relation to other semi-arid spaces in the world [8]. However, it is one of the least developed in terms of appropriate technologies, and became so during the 2000s due to actions by the Brazilian

federal government and the Articulation of the Brazilian Semi-arid (ASA), guided by the perspective of living with the semi-arid [9].

Institutionally, from the 1900s to the 1990s, the State was the actor with the greatest prominence in actions, specifically those to combat drought and those focused on technical aspects for cultivation and animal husbandry [10]. Between the 1990s and 2000s the Community, another institutional actor, composed of family farmers, cooperatives and associations, begins to legitimize its actions aimed at coexistence with the national semi-arid [11].

To support family farming, the Community started to have food for subsistence and also to sell to State programs (National School Feeding Program (PNAE) and the Food Acquisition Program (PAA). Linked to the perspective of autonomy of the family farmer [12], to fix him even more in the Brazilian semi-arid region, the insertion of the logic of the market has encouraged the opening of urban fairs composed of products from family agriculture, in which many have even started to seek, according to [13], organic certification.

Considering such aspects, there is an example of a cooperative in the semi-arid region of Alagoas, Brazil, that produces several agricultural products, but has stood out with the production of jaboticaba fruit. With this opportunity to commercialize their products, but with the inefficient logistics aspect, this study proposed a combination of SWOT analysis and Value-Focused Thinking (VFT) with the objective of structuring the problem, identifying the communities' objectives and developing alternatives to solve these problems so that they can get more from their production.

As contributions of this work, we can highlight: (a) better understanding of the problem situation through the steps of SWOT analysis and Value-Focused Thinking (VFT); (b) understanding of the operational techniques and the chain of small rural producers; (c) support for decision-making in the development of alternatives to solve these production problems.

Section 2 shows a brief literature review addressing food supply chain issues and recent publications related to the methodology applied in this study. A description of study locus and problem situation is presented in Section 3. The construction of the methodology applied with the cooperative is presented in Section 4, whose results are detailed in Section 5 along with the discussion and implications of the study. The last topic has a conclusion about the studies and ideas for future work.

## 2. Literature Review

This topic presents the theoretical elements that will guide the proposed discussions. Thus, we present the concepts of the Food Supply Chain and some application cases.

### 2.1. Food Supply Chain

Within the agri-food scenario the creation, functioning and evolution of food-supply chains, as well as studies on the unfolding of this reality, have become a key dimension in the development of new patterns of the rural production process [14,15]. In this regard [16] define that the food supply chain can be divided into five stages, including agricultural production, post-harvest handling, processing, distribution (retail or service) and consumption.

The phenomenon starts to be observed under the scope of food chains defined as alternatives, which are networks presented from a new policy and from aspects arising from an interest and demand for foods considered "more natural" and healthy [14,17]. This policy is responsible for distancing itself from the production of food with an industrial focus, essentially globalized, a mechanism that finds some limitation when consumer concerns with safe food are identified, together with perceptions from cultural dissonances that interfere in food tradition, limiting the action of globalization and leading to a reflection of changes in the commercialization of agricultural products [17], being centered since the

beginning in the conjugation of initiatives appropriate for this approach such as “organic agriculture, fair trade, local products, and short food supply chains” [18].

This approach tends to cause discontinuity in the long industrial chains, which are naturally permeated by a common complexity and organization typical of this conglomerate with global reach, leading to production based on associative networks that differ from the traditional supply chain [19–21] relate that the ability to re-socialize and re-spatialize are peculiar to short food supply chains, as they allow consumers to make value judgments about the relative desirability of food based on their own knowledge, experience, or perceived image, thus dynamizing the existing relationship between producer and consumer.

Producer–consumer relations are important in this scenario because it is from this significant interaction that increasingly complex and diversified interfaces between these players are designed, in terms of the types of relations and organizational characteristics that they exhibit [21].

According to [15], the instances acting in this sector face complex issues, occasioned by additional marketing uncertainties and a shorter product shelf life, demanding the formulation of specific planning models that incorporate issues such as harvest policies, marketing channels, logistic activities and even risk management. Short supply chains can be identified as expressions of attempts by both producers and consumers to match new types of supply and demand [21].

## 2.2. Background

With the attention focused on the supply chain of agricultural products in recent years [15], when analyzing the essays that address the food supply chain theme, it can be noticed that its authors use several contexts to develop their approach about the subject in question.

Applied through the concept of circular economy, a food supply chain analysis is viewed from the perspective of the barriers encountered to establish the practice of this economic approach in food supply chains in the studies of [22]. In this manuscript, barriers are identified in the context of food-supply chain as the following: “cultural”, “business and corporate finance”, “regulatory and governmental”, “technological”, “managerial” and “supply chain management”, with the development of practices allusive to Industry 4.0 being proposed as a way to overcome such challenges encountered.

Anchoring in discussions around circular supply chains, [1] in turn infers that the practice can exponentially generate value-added food, identifying that in this there are also considerable risks, suggesting the Internet of Things and an efficient management system within a supply chain as ways to ensure high transparency, interconnectivity and therefore efficiency in the process.

Still under this perspective of analysis of agri-food systems through the supply process, [23] performs, from a comparison of olive oil food supply chains, the inference that there is a greater appreciation among the compared agricultural products, from short supply chains, confirming trends and perspectives already observed in the literary context of the study in evidence.

Following this line [24], through Community-Supported Agriculture (CSA), which consists of shortening the food-supply chain, based on the understanding of this as a practice that goes beyond the maximization of profit derived from the family model, identifies through analysis of the applicability of this methodology in aquaculture management in the Barycz Valley, located in Poland, that the practice can become a necessary support for the sale of the product despite the local conditions not being favorable, in their entirety, to its development.

When conducting a study on the logistics of a short food-supply chain, ref. [25] point out the importance of logistics in the performance of short food-supply chains, as this is a challenge and is seldom discussed among researchers in the field, besides inferring that a series of actions should be considered in the itinerary of the implementation of this supply modality, such as the need to make sustainable environmental choices during

all stages of food distribution, optimization of the location of the nodes in the supply chain, improvements in the distribution route and restructuring of the supply chain, as well as contributions by farmers, ranging from the adoption of open approaches to the application of innovative distribution systems to vertical and horizontal collaboration and even cooperation with researchers.

Focusing on the understanding of the developments caused by food chains in forest regions, [26] reference the discussion if the policies found in the supply chain implementation interfere in the livelihood results. They identify that certification and code of conduct policies applied to the research units of analysis interfere with positive outcomes through increased farm income for some businesses, although when simultaneously comparing cases of conservation and livelihoods, they did not identify evidence of trade-offs between these factors.

In part of the recent articles it is common to find discussions and propositions by scholars about the innovation that can be implemented within the supply process of a food chain, whether in its technical or practical aspects. In this way [27], p. 14, understand that the innovations brought by means of digital technologies were able to provide an improvement in the links between the stakeholders of the agri-food chain, since “consumption, production and distribution are the segments of the agri-food chain where most of these digital technologies operate”.

The works by [28,29] carried out a survey of the key factors in the production chain of Brazilian family farming: discontinuity in product supply and production scale; demand; production outlets and commercialization channels; credit structure; government support and technical assistance; technologies; market information and market competition, among others. Some of these factors will be analyzed in the object of study in question.

Refs. [30,31] use a SWOT analysis to identify the aspects that influence small producers in sustainable development practices regarding their production. Meanwhile, Patidar, Agrawal and Pratap (2018) identify the development strategies aiming at the sustainability of the Indian supply chain as weakness and strengths through SWOT analysis.

The VFT method has been used in several contexts, including those related to rural and environmental issues; refs. [32,33] use VFT for structuring problems and discoveries of difficulties in the reverse logistics process of manufacturing coffee capsules.

The literature has shown the importance of using sustainable tools incorporated in the production process in the food-supply chain, using different approaches and analyzing different contexts in an attempt to measure these impacts. There is also emphasis on the need for analysis in shorter and more rudimentary chains, as is the case of the object of this study.

The literature review allowed for a better understanding of the problem and indicated the similarities of techniques and results found. This demonstrates that there are no works that classify the “values” of the VFT from the SWOT analysis in similar contexts. Although they are not new methods, it is a different approach which reflects the paper in a practical context.

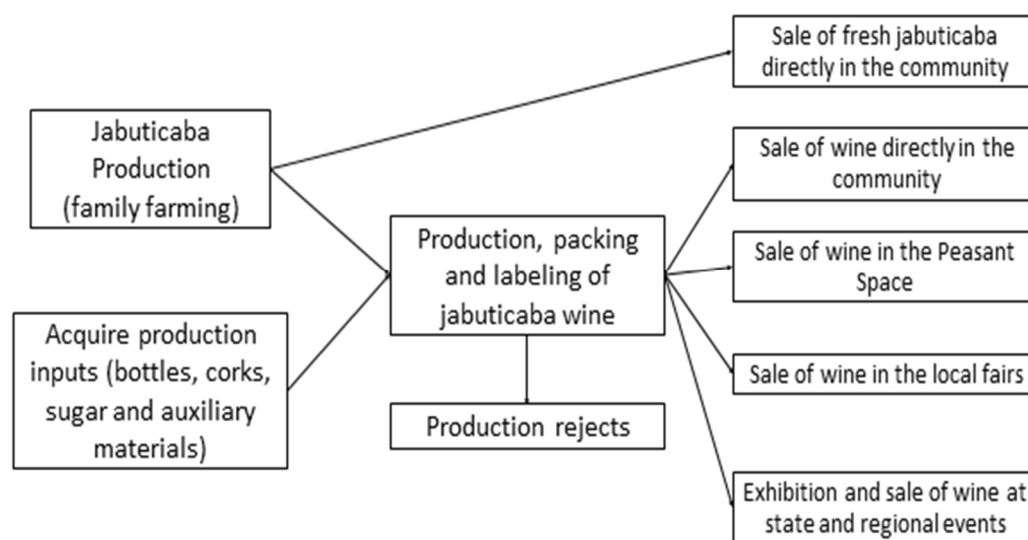
### 3. Problem Situation

The cooperative object of study called Cooperativa Mista de Produção e Comercialização Camponesa do Estado de Alagoas (COOPCAM), which opened in 2011, is located in the following border communities: Serra das Pias, Serra Bonita and Monte Alegre. All are part of the rural area of the municipality of Palmeira dos Índios and are composed of 15 families that operate in three main fronts regarding the commercialization of products: vegetables; plants—especially the succulents—and the jabuticaba processed products, from the liquor (produced since 1970), the fermented (produced since 2018) and the sweet (produced since 2020). For these three fronts, from cultivation, harvest, elaboration to commercialization, the actions are carried out by the community itself.

Regarding the geographical space, there are about 815 (eight hundred and fifteen) jabuticaba trees irregularly scattered. The curious thing is that none of these were planted

by local people, whose local records indicate that there has been human presence for more than 100 (one hundred) years. The whole scenario of this flora was formed naturally, mainly due to the movement of the birds and local animals that consume the fruits and leave the seeds in the area, considered to be an agroforest, since jabuticabeira, jackfruit, orange, cashew, umbuzeiro and coffee trees coexist in the same space.

The relationship of these residents with the processing of jabuticaba fruit dates back to the mid-1970s, when an employee of the state agency, the National Institute for Colonization and Agrarian Reform (INCRA), provided a recipe to a resident who started producing what is locally called jabuticaba wine. Figure 1 is a flowchart that summarizes the stages of the supply chain of its production.



**Figure 1.** Jabuticaba supply chain in Palmeira dos Índios.

This community production process involves the participation of local residents from the harvest. From preparation to tasting, it has historically been much more symbolic, immaterial and cultural. However, since 2015, the residents have approached the market logic, starting to market—in local fairs and in state and regional events, both linked to the semiarid theme—the hitherto named jabuticaba wine.

Looking at the supply chain considering the post-production stages, it is verified with respect to the sale that there is: (i) the so-called Peasant Space, built in 2016 on the side of the road, for the disposal of their production. In this space, the logic is for the consumer to travel to this specific place to buy the products. Still under this logic, the products are also marketed when (ii) interested parties seek out the residents in the community itself to purchase the products. In order to bring the products closer to the consumers, (iii) the residents themselves take the products for sale in local fairs. However, in situations where displacement is necessary on the part of producers, they face the difficulty of not having a vehicle to transport this production and, therefore, are always below the local potential.

When the focus is on the stages preceding the production of wine, besides the production and harvest of jabuticaba, there is a local campaign for the donation of wine bottles, which are sanitized in buckets and then bottled using cork stoppers bought by the farmers. In this sense, the limitations are about the dependence on donations of bottles and the purchase of cork stoppers which, currently, counts on only one supplier.

#### 4. Methodology

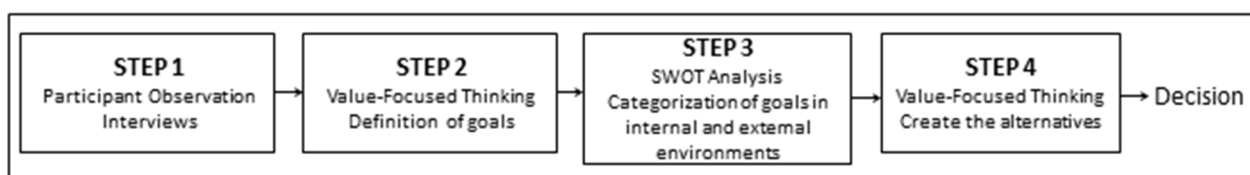
This research can be classified as descriptive and qualitative because it describes the characteristics of the phenomenon and uses a qualitative approach to analyze the problem and to propose an objective framework and alternatives. This study also contributes to the literature in the field of management, because it considers and respects the locus as a



realm of singularities. Its participants understand and act on a given context, from which historically was constructed as satisfactory, considering its own contingencies and complexities [34]. Based on this assumption, the tools and theory in management (the inputs) are not imposed, but they are inserted on their own merit, that is, based on empirical demands.

Values-Focused Thinking [35] and SWOT analysis form the methodological basis of this study. Data collection is based on participant observation and interview (Appendix A). In the participant observation phase, one of the authors participated in immersion with the entire production process, from the harvesting of the Jabuticaba fruit to the sale of the products. The producers are asked generative questions, that is, when a question is asked to the participant in order to instigate him to narrate, with a historical–temporal trajectory, the situations that correspond to local characteristics of the order participants [36]. Thus, the generative question for each participant was: We tell, freely, your trajectory—from the beginning to the present day—to organize the production and marketing of jabuticaba—derived products.

The participant observation is the result of an extension project of the Federal University of Alagoas with rural producers since 2018. In order to understand the phenomenon of production and the difficulties faced by producers, some studies have been conducted since then through direct observation. The interviews developed for the present manuscript were conducted in 2021. Figure 2 summarizes the steps to achieve the research objectives.



**Figure 2.** Research flowchart.

Afterwards, interviews were conducted in two stages with four participants—community leaders in relation to local management, harvesting, production and marketing—when investigations were made according to VFT and SWOT. Thus, part of the framework was designed from participant observation and part from interviews. The interviews aimed at a more comprehensive understanding of the situation considering the farmer’s own view and also aimed at validating the results.

The author of VFT points out that common thinking about situations, where the decision-maker first thinks about the problem and then thinks about what he wants to achieve, reasoning is limited to obvious solutions and new opportunities go unnoticed. He classified these methods as Alternative Focus Thinking. In contrast to these methods, when a decision-maker structures the situation by prioritizing the understanding of his own goals and how to achieve them, it is called values-focused thinking. The method developed by Keeney is its namesake [35].

Thus, VFT is developed in order to define and organize the objectives of the people involved in this decision environment. Thus, it can be divided into three steps: identifying objectives; connecting related objectives and classifying them; developing alternatives that best fit these objectives. The third step is the key point of VFT since it directs actions towards the realization of its objectives, rather than just solving a problem.

The identification of goals was achieved by asking “what do you want to achieve?”, “where do you want to go?”, “is there something wrong?”, “what is preventing you from achieving them?”, and so on. These are the main interview questions.

The second step, by connecting the related objectives, allows you to build a representative framework and classify the objectives into means objectives (necessary to achieve another objective), both fundamental (issues central to the situation) and strategic (aspects central to the organization’s strategy). By looking at the structure of the objectives, alternatives/actions can be developed in order to achieve them one at a time or sometimes a single alternative can also benefit several objectives at the same time.

However, some aspects relevant to achieving these objectives may not necessarily be under the control of the decision-maker. For this reason, a SWOT analysis was implemented on the exploration phase of the VFT objectives by classifying key means and objectives as related to a Strength, a Weakness, an Opportunity or a Threat [37–39]. In this way, the course of action to be designed to achieve the objectives takes on different characteristics:

- For those categorized as Strength, actions are directed to take more advantage of these aspects—it depends only on themselves;
- For Weaknesses, actions are directed towards eliminating these negative factors—this also depends only on themselves;
- For Identified Opportunities, actions are aimed at preparing the organization to get the best out of itself—but occurrence depends on external factors;
- For Identified Threats, actions focus on how to deal with these situations that are not under the organization's control and can negatively influence the business.

Following the above description, the next section describes the results obtained and presents a discussion about them.

## 5. Results and Discussion

This topic presents the elements obtained through participant observation, the application of the VFT method, and the SWOT analysis to understand the problem and propose alternatives.

### 5.1. Results from Participant Observation

The participant observation data demonstrated the compositions of the Jabuticaba fermented productions in 2019 and 2020. It was verified that the 2020 production had a sharp increase compared to 2019, taking into account the good harvest obtained in the respective fiscal year. Therefore, the production had a positive variation of 152.86% (1770 L) in 2020, as opposed to the 2019 production (700 L).

In addition, the behaviors of the finished product losses were observed. It was seen that the finished product loss had a positive variation, that is, an increase of 12.39% (525 L) between 2019 and 2020, an elevation caused by the following relationship found: proportionally, the more one produces, the greater the loss of the product produced.

Thus, it is notable that the lack of mechanization and the adoption of rustic methods to the production process of COOPCAM in the production of Jabuticaba wine causes this loss of product to be intensified. Moreover, the cooperative no longer commercializes this quantity of wine, which results in an increase in the cost of the liter produced, considering this loss as “normal” within the production process.

Regarding the finished product for sale, it was observed that despite the increase in production between 2019 and 2020, the quantity of product sold suffered a decrease. This occurred mainly due to the fact that the jabuticaba fermented fruit has a dry-type flavoring, since sugar and cachaça, both used in the production of jabuticaba liqueur, were removed from the production process. Choosing to produce a fermented wine caused the sales positioning to be redirected to a more urban public that also appreciated dry wine.

Besides structural issues, the difficulty encountered by local farmers is in relation to the distribution of their products derived from jabuticaba, because they need the following:

- Appropriate logistical support, from the harvest to the transport to the production headquarters;
- Logistical support to commercialization places in other potential municipalities such as the capital, Maceió and other states;
- Storage of the jabuticaba, because it is a fruit that ripens and degrades very fast due to its rich composition of sugars and nutrients. The refrigeration structure is insufficient;
- It is still necessary to determine the chemical composition of the product to define the alcohol content of the drink. This is an important factor for marketing the product in other states, including with regards to air transport of the product for commercial flights by passengers, if they purchase the product and want to take it as souvenirs.



The survey of key factors in the production chain in Brazilian family farming during the participant research was performed by classifying them according to elements pointed out by literature. The authors mention recurrent problems in family farming, some of which were also identified in the present case, as described below.

- Discontinuity in product supply and production scale.

The jabuticaba liqueur had been produced since 1971 (although it was always called jabuticaba wine) for their own consumption in the June parties in the rural area of Palmeira dos Índios. The production of the wine itself started in 2019 and occurs only in the months of March to June and depends on the rains in the region. It is planned for 2021 to create new products derived from the jabuticaba fruit, such as the sweet of the fruit and the sweet of its peel, in addition to the fermented fruit and the liqueur.

- Demand, production outlets and commercialization channels.

Limited demand for the product due to difficulties in transportation to the commercialization sites. Product has demand; however, the cooperative does not yet have good logistic capacity for its distribution. The labels do not yet meet the required standards, which makes it difficult to deliver the product and sell it in larger centers. Sales are mainly due to the participation in agroecological fairs and from clients who already know the product. For now, sales take place in the current physical space, at fairs and/or by order.

- Credit Structure.

The resources for the actions and investments come from the MPA (Small Farmers Movement) and from COOPCAM (Cooperativa Mista de Produção e Comercialização Camponesa de Alagoas), in addition to the resources from the sales of vegetables, liqueurs and fermented products that are being used to build the production space and to acquire new production equipment.

- Government support and technical assistance.

Government support is provided through technical assistance from the following agencies: EMBRAPA Alagoas, Sebrae, the Alagoas Maior Program [Alagoas government], the ECOFORTE project with AAGRA (Alternative Farmers Association) and research from UFAL (Federal University of Alagoas).

- Technologies.

The production process is going through a modernization process. Stainless steel barrels were purchased for the fermentation of the beverage, and a cistern was built to catch water, which is scarce in the production space. The organization of the production system was started, identifying processes and organizing flowcharts.

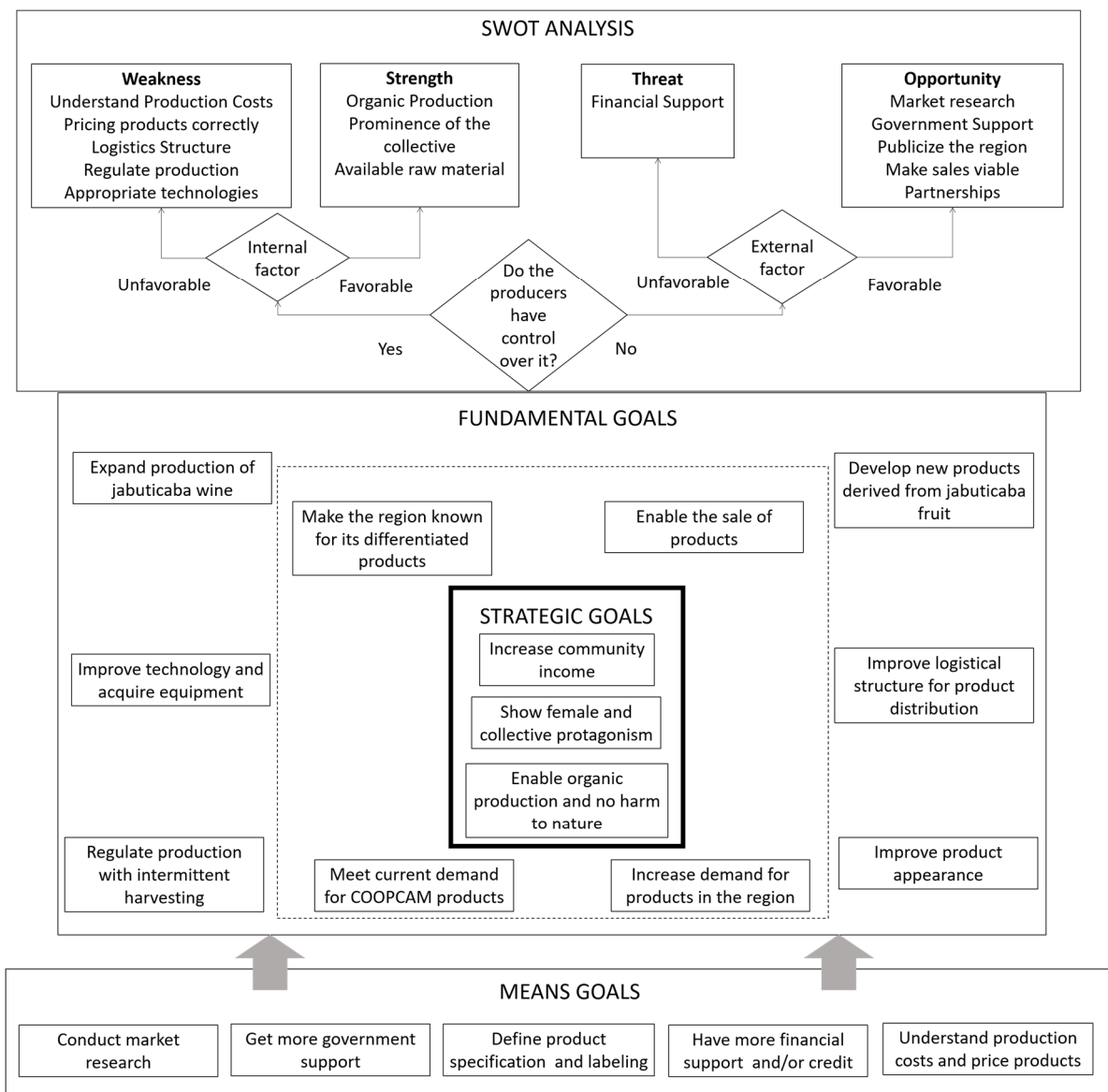
Several aspects were related in the participant observation. In order to organize the problem situation, the next section describes the results of the VFT as a tool for structuring problems and defining strategic decision elements.

## 5.2. VFT-SWOT Situation Structuring

Once the description of the environment was made, one could see that several problems are faced simultaneously. In order to organize the constituent elements of this problem and transform them into objectives, the information was organized according to the Value-Focused Thinking methodology. Thus, with participant observation it was possible to identify elements related to what is wrong and the constraints of the activity, which were already converted into objectives to adjust or eliminate them. In other words, it comprises part of the first VFT stage of identifying objectives.

This step was then complemented with questions to identify the objectives, as described in the methodology, as well as with questions directed at the identification of strengths, weaknesses, opportunities and threats. In this way, we identify the objectives that represent the internal and external factors to the organization, that is, what is and what is not under the control of the community itself, respectively.

Therefore, the SWOT analysis has the role of balancing the result of VFT on the creation of alternatives and decision opportunities, since the method of acting by the organization is different in face of the objective that is being considered, as stated in the methodology. Therefore, the SWOT analysis is a robust and extremely effective technique; it is found to be very helpful to clearly point out the current flaws and provide future direction [39]. Figure 3 presents the identified objectives already with their relations and classified as medium, fundamental or strategic and as to the SWOT quadrants. Thus, Figure 3 is a result of the problem structuring, which facilitates the understanding of this complex environment through a graphical representation. Furthermore, it serves as a guide for the proposition of solutions.



**Figure 3.** Flowchart of VFT objectives and SWOT analysis.

The means objectives are those necessary for the achievement of the fundamental objectives. Market research is necessary to understand consumer behavior regarding the acceptance of current products and the new products to be developed, as well as to measure the size of this market, essential for planning production capacity. The dimensioning of production, as well as the feasibility of trading the community's products, depends on the

understanding of costs and the consequent definition of prices in a way that at least covers the production costs and expenses, besides providing a profit margin.

Note that some production and product problems may be related to the lack of specific technology and equipment, as well as to the increase in production capacity to serve current and new markets. There is also the serious problem of the lack of vehicles, which makes it impossible to sell even though we have the production capacity and expectation of demand. For such investments, it is necessary to have more financial resources available.

Labeling products, including their specifications, is necessary to explore new markets. For some occasions, such as air transport, it is mandatory. Furthermore, they can take advantage of this need to create a label and turn it into an opportunity to improve the appearance of the products, which increases the demand for products of the region, making it also better known.

The support from the government and other institutions influences the dissemination of the community, can support fundraising, but also promotes interinstitutional cooperation, making it have more technical and technological support for the development of its activities, and adjust production and agricultural technology.

At the center of the objectives are the strategic ones. They are considered so because, according to the answers given, they are central issues and are not being considered so that it is possible to achieve other objectives. It is understood as the purpose of the business, therefore, to make the production and commercialization of organic products viable, to highlight the community as well as women's work, and to bring a better financial condition to the community. With good financial planning it is also possible to reinvest in production. However, this is a later stage that depends beforehand on the achievement of the means and fundamental objectives.

With the objectives defined, these were segmented into the quadrants of the SWOT analysis. According to [40], the elements that compose the SWOT analysis must be understood according to the following elements: "S + W" factors include: (1) management ability; (2) technological ability; (3) financial ability; (4) organization; (5) operations "O + T" factors include: (1) social and political context; (2) economic context; (3) market opportunities; (4) competition mechanisms.

The objectives were then grouped into internal and external factors, and again grouped into strengths, weaknesses, threats and opportunities. With this defined, the process becomes clearer for the establishment of alternatives. It is worth noting that according to [35], the first alternatives created are generally the most obvious, those that have been used before in similar situations and those that are already widely available. The development of alternatives is initially based on the means objectives themselves and by combining them in order to develop alternatives that satisfy more than one objective simultaneously.

The alternatives can be seen in Table 1, and are classified according to the control capacity (external or internal factor to the community) and related to one or more objectives. These alternatives, since they are created based on intermediate objectives, are considered for a quick start (short term), since not reaching these objectives can delay the achievement of the organization's strategic objectives.

A1 is a course of action that is considered external because it depends on the approval of another institution to be confirmed. The region has public university centers, as well as public institutions that promote projects aimed at improving productive systems. A2, in turn, depends exclusively on the cooperative itself. Understanding the production costs of the products is fundamental for a correct definition of the operational result and calculation of the profit of the cooperative. Costs are also used to make decisions about production mix and investments. If managers do not have knowledge about costing tools, the partnerships reported in A1 are also suggested for this activity.

Although currently, due to various restrictions, it is not possible to meet all the perceived demand, the market study is necessary (A3) since making investments without a better commercialization perspective can be risky for the cooperative. Therefore, it is interesting that this is one of the first actions to be taken. Furthermore, market research

can be used to attract investors or justify public funding needed to expand and improve production and logistics activities (A4).

**Table 1.** Alternatives identified.

ID	Alternatives	Internal or External?	Related Objectives
A1	Seek partnerships with public institutions to provide support in determining product characteristics for specification and insertion of information on labels.	External	Define product specification and labeling Get more government support
A2	Analyze the composition of the production costs of each product individually to support the pricing and financial management of the organization.	Internal	Understand production cost and pricing products
A3	Conduct market research to understand the real demand for the products	Internal	Conduct market research
A4	Seek government support to obtain funding for the investments needed by the organization	External	Get more government support Get more financial support/credit
A5	Assess the current state of finances for reinvestment of financial resources in one's own activity	Internal	Get more financial support/credit
A6	Seek interinstitutional and governmental partnerships for support in <ul style="list-style-type: none"> <li>• Agriculture techniques;</li> <li>• Production and quality-management techniques;</li> <li>• Logistics;</li> <li>• Marketing.</li> </ul>	External	Get more government support

A similar reasoning of A2 can be applied to A5. Besides establishing a cost structure, it is necessary to study the financial and budgetary capacity of the organization in order to evaluate the reinvestment capacity. This alternative gains even more importance in a possible denial of the external investment alternatives. It is worth pointing out that in this issue one faces a dilemma, since the income of the communities that are part of the cooperative is also a strategic objective. Then, this reinvestment must be discussed internally so that this investment possibility does not harm the community's income at this time.

A6 refers to the interinstitutional support in the various stages of the jabuticaba production chain. The difference between A6 and A1 lies in A6's long-term vision. While A1 refers to the adjustment of an already commercialized product, with punctual improvements. A6 refers to studies and actions that will bring returns later. As examples, green production techniques, both agricultural and manufacturing, can be applied to increase productivity, marketing to increase brand value, logistic organization and other actions in partnership with specialists.

These alternatives are not prioritized. It is understood that they are urgent actions for the organization. The prioritization may be the result of another study, but concerning the activities that will be carried out to achieve the fundamental objectives. It is worth mentioning that this work was limited only to the proposition of alternatives, which will be presented to the rural producers; however, their application and analysis is beyond the scope proposed here.

## 6. Conclusions

Family farming has improved the quality of life of several small producers throughout the Brazilian territory, by offering an income expectation through the commercialization of their products. However, a series of barriers have been presented by these producers throughout their production chain, as is the case portrayed in this article.

The methodology proposed in this article sought to identify the main problems presented in the production chain of the jabuticaba fruit, through participant observation. With this, it was possible to understand that despite the great potential presented by the product for commercialization, the producers presented problems in the production, sale and delivery of the goods.

The use of the VFT approach combined with the SWOT analysis made it possible to identify the main objectives (means, fundamental and strategic), categorize them in the internal and external environments and, at last, propose some alternatives that could subsidize the decision process from short- to long-term. With this, producers can clearly identify the actions to be taken for operational, managerial and strategic improvements. The methodologies are especially useful and easy to reapply to similar contexts and situations.

The alternatives or actions recommended in this study aim, therefore, at concentrating efforts to meet the objectives indicated by the cooperative members themselves. The recommendations of this study aim, therefore, at concentrating efforts to meet the objectives indicated by the cooperative members themselves, but also deepening this vision from the participant research. This step, along with the VFT and SWOT, made it possible to see problems and alternatives whose relationships and importance were not necessarily clear. With this, producers can clearly identify the actions to be taken for operational, managerial and strategic improvements. The methodologies are especially useful and easy to reapply to similar contexts and situations.

The main limitation of the work is due to the characteristic of decision support methods, since a result is valid only for this particular situation, at this moment and with this group of decision-makers who answered the questions. Changes in these aspects of the decision environment may lead to different results. For future work, the use of the multi-criteria decision support approach is suggested for bidding the weights and criteria of the producers, as well as in the ordering and prioritization of alternatives, especially when the means objectives are being met.

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## Appendix A

### Questionnaire

**Objective:** The questions were designed to identify the operation of the production chain of items produced with jabuticaba fruit.

These must be answered in the following aspects (Q1 and Q2):

- (a) Management resources;
- (b) Technological inputs;
- (c) Organization;



(d) Operation.

**Q1: What are the strengths of the production of items related to jabuticaba?**

- 1.1 What are the advantages of producing using jabuticaba?
- 1.2 What factors make the product competitive and accepted in the market?

**Q2: What are the weaknesses of the production of items related to jabuticaba?**

- 1.3 What could be improved in the operation of the business?
- 1.4 What is not done correctly in production?
- 1.5 What obstacles prevent the regular marketing of products?
- 1.6 Which aspects of the Jabuticaba chain can be strengthened?

These must be answered in the following aspects (Q3 and Q4):

- (a) Social and political context;
- (b) Economic context;
- (c) Market opportunities;
- (d) Competition/Competitors Mechanism.

**Q3: What are the opportunities Farmers can explore to produce jabuticaba fruit and its by-products?**

- 1.7 What are the possibilities that producers identify in the production of items related to jabuticaba?
- 1.8 What benefits would producers have with the production of items related to jabuticaba?

**Q4: What are the threats that Farmers might face when in production of jabuticaba fruit and its by-products?**

- 1.9 What external obstacles do Producers see in the production?

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