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ORIGINAL

Elaboration of a training plan in the technical management of the copoazú crop for producers of La Vereda de Balcanes in the municipality of Florencia, Caquetá

Elaboración de un plan de formación en el manejo técnico del cultivo de copoazú para productores de La Vereda de Balcanes del municipio de Florencia, Caquetá

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ABSTRACT

The production chain of Amazonian fruits, such as copoazú, is gaining relevance due to its food potential and its applications in various industries. In Colombia, especially in the department of Caquetá, copoazú is presented as a business opportunity that can contribute to economic and social development, particularly in areas affected by violence and poverty. This internship focuses on developing a training plan in the technical management of the copoazú crop for producers in the Balcanes district of the municipality of Florencia, Caquetá. This plan aims to improve ecological agriculture and provide farmers with technical knowledge that will allow them to increase their productivity and improve their quality of life. The training plan will include learning modules that will address the specific needs and requirements of Copoazú farmers. A qualitative approach of a descriptive nature will be used, applying techniques such as surveys and interviews with six farmers selected for convenience. This methodology will allow for the collection of detailed data on participants' perceptions and knowledge, facilitating the design of more effective educational strategies. The study also considers the international context of copoazú cultivation, highlighting the lack of technical assistance and training in producing countries such as Bolivia and Peru. In Colombia, although copoazú has high economic and nutritional potential, producers face challenges related to technical assistance and market integration. The importance of promoting sustainable agriculture is emphasized throughout the document, aligning with the Sustainable Development Goals, such as "zero hunger", "responsible production and consumption" and "climate action". The implementation of agroecological practices and the strengthening of farmers' organizational capacity are essential to ensure sustainable development in the Amazon region. In conclusion, this internship work seeks to establish a sustainable agricultural program in the Balcanes village, optimizing copoazú crops and improving the living conditions of farmers through a technical training plan adapted to their needs and the local context.

Keywords: Copoazú; Sustainable Agriculture; Technical Training; Rural Development; Amazonia University; Florencia; Caquetá; Colombia.

RESUMEN

La cadena productiva de los frutos amazónicos, como el copoazú, está ganando relevancia debido a su potencial alimentario y sus aplicaciones en diversas industrias. En Colombia, especialmente en el departamento del Caquetá, el copoazú se presenta como una oportunidad de negocio que puede contribuir al desarrollo económico y social, particularmente en áreas afectadas por la violencia y la pobreza. El presente trabajo

de pasantía se centra en elaborar un plan de formación en el manejo técnico del cultivo de copoazú para productores de la vereda Balcanes del municipio de Florencia, Caquetá. Este plan tiene como objetivo mejorar la agricultura ecológica y proporcionar a los agricultores conocimientos técnicos que les permitan aumentar su productividad y mejorar su calidad de vida. El plan de formación incluirá módulos de aprendizaje que abordarán las necesidades y requerimientos específicos de los agricultores de copoazú. Se utilizará un enfoque cualitativo de naturaleza descriptiva, aplicando técnicas como encuestas y entrevistas a seis agricultores seleccionados por conveniencia. Esta metodología permitirá recopilar datos detallados sobre las percepciones y conocimientos de los participantes, facilitando el diseño de estrategias educativas más efectivas. El estudio también considera el contexto internacional del cultivo de copoazú, destacando la falta de asistencia técnica y capacitación en países productores como Bolivia y Perú. En Colombia, aunque el copoazú tiene un alto potencial económico y nutricional, los productores enfrentan desafíos relacionados con la asistencia técnica y la integración en los mercados. La importancia de promover una agricultura sostenible se subraya a lo largo del documento, alineándose con los Objetivos de Desarrollo Sostenible, como el "hambre cero", la "producción y consumo responsable" y la "acción por el clima". La implementación de prácticas agroecológicas y el fortalecimiento de la capacidad organizacional de los agricultores son esenciales para asegurar un desarrollo sostenible en la región amazónica. En conclusión, este trabajo de pasantía busca establecer un programa agrícola sostenible en la vereda Balcanes, optimizando los cultivos de copoazú y mejorando las condiciones de vida de los agricultores mediante un plan de formación técnica adaptado a sus necesidades y al contexto local.

Palabras clave: Copoazú; Agricultura Sostenible; Formación Técnica; Desarrollo Ruralersidad de la Amazonia; Florencia; Caquetá; Colombia.

INTRODUCTION

According to Escobar and Vos (2022), Amazonian fruits are emerging as a productive force, given their high-quality nutritional potential. Farmers are increasingly joining forces to promote the consumption of these agricultural products through organizational efforts that are gradually strengthening as they acquire training and technical support. In Colombia, for example, experts such as Galeano (2011) and Forbes (2023) state that the copoazú fruit is one of these promising, exotic Amazonian fruits with multiple applications in the pharmaceutical, food, and cosmetic industries, where a high content of polyphenolic compounds with important benefits for human health and well-being has even been found.

In Caquetá, copoazú areas are part of Colombia's biodiversity (Pabón, 2022), where this crop has emerged as an attractive and profitable business opportunity that promotes economic development in one of the regions most affected by years of violence, discrimination, inequality, poverty, and conflict (Meneses, 2020). Poverty reaches alarming levels of 47 %, with extreme poverty at 10 %, according to recent reports (DONATE, 2022). Hence, this internship work is an opportunity to support producers in the village of Balcanes in Florencia, Caquetá, to strengthen organic farming and train these farmers efficiently in the technical management of copoazú.

With these initiatives, producers in this village will be able to establish sustainable and environmentally friendly copoazú crops, ensuring the well-being of their families and the surrounding community. It is hoped that a training plan consisting of learning modules will contribute significantly to their technical knowledge so that they can increase their productivity and, as a result, achieve better incomes that will allow them to have a good quality of life. All of this is being done with the research goal of implementing clear actions toward establishing sustainable agriculture, essential for promoting economic and social development, especially in this rural community, to reduce poverty and inequality (FAO, 2022).

The overall objective of this document is to "Develop a training plan on the technical management of copoazú cultivation for producers in the village of Balcanes in the municipality of Florencia, Caquetá," to provide technical assistance and support for the development of solid knowledge so that copoazú producers can obtain more significant benefits from their crops. To achieve this purpose, actions will be carried out in line with specific objectives, starting with an assessment of producers' knowledge, followed by the design and implementation of learning modules on topics of interest, and, finally, an analysis of the learning methodology developed to achieve the overall objective.

The processes will be managed from a qualitative, descriptive approach, applying survey techniques, interviews, and learning modules to six (6) copoazú farmers from the Balcones de Florencia village in Caquetá, who was chosen for convenience, as this is a non-probabilistic technique that allows access to study participants for the duration of the internship.

There are currently various scientific and research contributions that highlight the importance of improving

crop management techniques (Food and Agriculture Organization of the United Nations [FAO], 2022) through strengthening and training plans in response to the need to achieve sustainable agriculture (Economic Commission for Latin America and the Caribbean [ECLAC] and FAO, 2022), that allow food to be produced efficiently and profitably without compromising soil and ecosystem health (Sarandón, 2020); with strategic actions for the preservation and conservation of biodiversity (Sans, 2022).

Shiva (2020) and Albarracín et al. (2019) state that sustainable agriculture is essential for promoting economic and social development, especially in rural communities, and is a key issue underlying the Sustainable Development Goals (SDGs), specifically Goal 2: "zero hunger," goal 12: 'responsible consumption and production,' and goal 13: 'climate action' (ECLAC and FAO, 2022). They also establish that sustainable agriculture can contribute to eradicating hunger by ensuring food security through better use and exploitation of natural resources (Masís, 2010), mitigating climate change, and offering resistant, abundant, diverse, and healthy crops (Spanish Office for Climate Change [OECC], 2022).

Amazonian fruits, for example, are grown and consumed in different parts of the world. Still, most of the production and consumption is concentrated in Brazil and other countries in the Amazon region (Murcia & Vargas, 2019). According to Aguilar (2020), the Amazonian fruit production chain is estimated to benefit more than one million harvesting and processing families in this region. The Amazonian fruit copoazú is grown in several areas with extensive land and climatic diversity (M.A.C.I.A., 2019). In Bolivia, copoazú is known as white cacao and is considered a profitable fruit for export (Polanco, 2022). In Peru, there are regions with a large production of this native fruit, which benefits the rural, family, and community economy (Zarate, 2022).

However, in the international context where copoazú-producing countries are located, a complex picture emerges, with a lack of technical assistance and skilled labor for crop management (Aguilar, 2020), where rural producers do not have access to ongoing training through strengthening and technical management plans for this crop, This means that this Amazonian fruit is not being used to its full potential (Meneses, 2020). In Peru, given this problem, the National Agricultural Health Service (SENASA, 2017) has provided technical assistance to copoazú farmers, reducing the incidence of pests and improving the quality of local production.

In Bolivia, problems are also evident due to the lack of ongoing training, generational change, and limited technical supervision, which hinders the export of copoazú (Villafuerte, 2021). Producers do not always have access to the information or resources necessary to harvest this fruit effectively (Lucias, 2017). Similarly, Murcia et al. (2019) state that forest fires in this country have destroyed many crops, creating considerable uncertainty about their future sustainability. In addition, access to markets and land are analyzed as other problems facing copoazú cultivation, where there is no infrastructure, adequate distribution channels, or land available for cultivation, which limits production and profitability (Ramírez & Wesz, 2022).

In Colombia, experts such as Galeano (2011) argue that the copoazú fruit is considered exotic and promising, with multiple applications in the food, pharmaceutical, and cosmetic industries. It is even a promising fruit due to its high polyphenolic compound content, potentially benefiting human health and well-being (Forbes, 2023). In addition, its harvests are attractive for economic growth, especially in Amazonian regions severely affected by conflict and violence (DONATE, 2022).

Copoazú areas in Colombia are explicitly found in Caquetá, which is considered one of the fruits of Colombian biodiversity (Pabón, 2022). Its cultivation represents an attractive business opportunity to promote development in conflict-affected and rural areas such as those in the Department of Caquetá (DONATE, 2022). In Meneses' study (2020), a copoazú planting area of 50 hectares was recorded in 2016 in the Colombian Amazon, where the harvest area in 2016 was 45 hectares with a production of 260 tons and a yield of 5.78 tons per hectare.

However, problems are analyzed in this region of the country, where there is an ineffective process for technical assistance (Contreras, 2017), and training processes are only aimed at training but not at effective education in technical crop management. As a result, it is common to find isolated and disjointed processes that are far removed from what producers really need, as heterogeneous conditions arise according to the context and reality, revealing needs that must be addressed (Gutiérrez et al., 2019). Thus, some needs highlight the importance of strengthening sustainable agriculture with strategic actions that lead to the establishment of profitable copoazú crops that contribute to food security alongside economic growth (Ríos, 2019), especially in this area where poverty reaches 47 % and extreme poverty 10 %, with producers interested in finding ways to generate economic benefits while protecting forests and ecosystems (DONATE, 2022).

Although copoazú cultivation and fruit processing are strategic, profitable, and sustainable businesses for the Colombian Amazon (Contreras, 2017), the reality is that actions are needed to consolidate both knowledge and actions for the establishment of sustainable crops, which also promote market inclusion (Ríos et al., 2017). These actions should be aimed at establishing strengthening and training plans and providing investment resources to improve infrastructure and production chains to increase the crop's profitability (UNDP, 2017). This should be promoted through efficient government policies and investment by public and private entities in the agro-industrial sector (UN, 2018).

In addition to this, the analysis shows how, in the last decade, the public policies established in the 2014-2018

National Development Plan and Colombia Siembra have been short-ranged, given the limited implementation initiatives (Contreras, 2017), where copoazú farmers had little access to technical assistance and, as a result, the level of technology adoption was also low (Ríos et al., 2017). In addition, the study evaluates farmers' lack of knowledge of market demands and trends, which impacts producers' low initiative and interest in increasing their production systems by adding value to these products (Diaz, 2020).

However, in the village of Balcanes in the municipality of Florencia, Caquetá, there is a similar situation where there is little training in the technical management of copoazú cultivation, little labor available to manage these crops, low generational renewal, and poor working conditions for producers who added to their advanced age, cause them to give up growing this Amazonian fruit. This village has six copoazú producers with between one and two hectares of planted area, whose production has reached half a ton per year.

It is necessary to generate methodological strategies with the design of modules that allow for the promotion of copoazú production and commercialization through innovative training processes that encourage the development of technical and administrative skills and capacities within the framework of sustainable agriculture and social and economic development, involving all actors in the production chain. All this through the adoption of a strengthening and training plan aimed at structuring and strengthening the organizational capacity of farmers through technical assistance. This results in support for farming families in this village to improve their quality of life, health, and well-being.

This support plan for training in the technical management of copoazú cultivation is aimed at strengthening the aspects, needs, requirements, expectations, and training interests of these producers to optimize their crops through agroecological actions sustained by the purpose of creating better opportunities for all, which transcend into tourism and climate change mitigation by implementing environmentally friendly actions. This work aims to develop a training plan in the technical management of copoazú cultivation for producers in the village of Balcanes in the municipality of Florencia, Caquetá.

Taking into account the Sustainable Development Goals (SDGs), which establish clear actions to develop ecological agriculture, which is essential for promoting economic and social development, especially in rural communities (FAO, 2022), it is necessary to design and implement a training plan on the technical management of copoazú crops in the village of Balcanes in the municipality of Florencia, Caquetá. This will enable support to be provided to producers in this region through processes of recognition of needs, requirements, and expectations and then allow strengthening actions that lead to the establishment of sustainable Copoazú crops that contribute to the family economy and the protection of the environment.

Through this training plan on the technical management of Copoazú crops, producers in the village of Balcanes will be able to optimize their production systems with agroecological actions supported by the opportunity to create better living conditions for themselves, their families, and the surrounding community. This Amazonian fruit in the department of Caquetá stands out as part of Colombia's biodiversity and as a crop that represents an attractive business system for promoting economic development in areas such as these, which have been significantly affected by violence and conflict for decades (DONATE, 2022; Forbes, 2023).

From a methodological standpoint, the training plan will be developed through learning modules with a guide that allows producers in this village to improve their actions, practices, and experiences to obtain greater profitability and productivity in their agricultural economic activity while performing biodiversity preservation functions. Regarding the contributions from the practical work and support provided by the research intern, there is an opportunity to establish a sustainable Copoazú agricultural program in this critical region of the country, allowing for producing a product with high commercial and nutritional value. The underlying goal is to work sustainably to conserve the Amazon and use these Amazonian fruit trees in partnership with the local communities in this region.

The learning modules included in the training plan for the technical management of copoazú cultivation are based on a practical assessment of the needs and requirements of producers in the Balcanes district of the municipality of Florencia, Caquetá, and then provide training and support to strengthen the knowledge of these farmers and sustainably enhance their crops to obtain better opportunities in the local and regional markets while practicing agroecological practices to conserve the biodiversity of the Amazon.

Copoazú is a tropical fruit tree that grows wild in the Amazon basin in Peru, Colombia, Ecuador, Bolivia, and Brazil (Ministry of the Environment, 2022). Its economic importance lies in its high nutritional value, which is marketed fresh and processed in many parts of the world. It belongs to the tropical rainforest zone, growing at temperatures of 21 to 27°C with relative humidity between 64 and 93 % (Zarate, 2022). In Colombia, for example, it also grows in acidic soils with low percentages of organic matter. The distribution of this species is reported to be anthropogenic, as the seed was first brought from Brazil, specifically from Manaus to Putumayo, and from there it has spread and been cultivated in departments such as Caquetá and Guaviare (DONATE, 2022).

The tree can grow up to 18 meters in the wild and has trichotomous branching starting at 14 months on average. The branches are plagiotropic with a balanced distribution of fruits (Wallace, 2015). This fruit is primarily used in indigenous communities, which include it as part of their diet. However, it is now an

agricultural product established through sustainable farming practices as part of sustainable agriculture. Given its high adaptability to the ecology and soils prevalent in this Amazonian region, it represents high economic potential. It has early fruiting, and multiple associations and groups of farmers have developed technologies for processing and preserving the seeds and pulp (Chaparro & López, 2018).

According to Agronet (2022), copoazú production in 2019 is estimated at 520 tons and 820 tons for 2021, with a planting area of more than 400 hectares planted with copoazú, especially in the departments of Caquetá, Putumayo, and Meta. This fruit has significant market opportunities, as it is a fresh fruit introduced into the industry for preparing energy drinks, butter, copúlate, cosmetic products, and fruit pulp, among others. With a low percentage of acidity, it has the potential to break into large international food companies.

As a result, copoazú has attracted the interest of many industry sectors, opening up a market that allows farmers to obtain more significant economic returns to ensure a good quality of life. However, within the technical management of copoazú cultivation, there is a reality in which producers in some regions of Colombia do not have the support or technical assistance that would allow them to apply better knowledge of sustainable copoazú cultivation, highlighting a reality in which their needs and requirements are unknown, as are their expectations (Gutiérrez et al., 2019).

Hence, the importance of creating inclusive businesses as a socioeconomic strategy has been established. Authors such as Chaparro and López (2018) express that in the department of Caquetá, there is an effective business opportunity in the cultivation of copoazú, which, once solidified, will allow rural families to escape the extreme poverty they find themselves. In addition, Diaz (2020) proposes that these actions should be based on innovative strategies to educate rather than train people so that they can acquire and apply their environmental management skills to the conservation of biodiversity in this important region of the country and the world.

METHOD

Location

La Vereda Balcanes is a rural area located in the district of San Martín, 35 kilometers from Florencia's municipality in the Caqueta, Colombia department. It is located at an approximate altitude of 290 meters above sea level, with a temperature of 30°C, annual rainfall of 2,500 mm, and relative humidity of 85 % (Lugo & Jaramillo, 2010). This village is dominated by hilly and fertile landscapes, where the land is divided into plots, and the inhabitants are characterized by a lifestyle associated with rural and traditional socioeconomic, cultural, and technological dynamics typical of a family, peasant, and community economy. Figure 1 shows the location of the Balcanes village in the municipality of Caquetá (figure 1).

The land is limited, the technologies used are traditional, production is small-scale, and self-consumption prevails, with the inhabitants of this area growing what they eat and selling certain agricultural products to the surrounding community through small exchanges and short commercial circuits. The sale of these products allows for the sustainability and reproduction of the productive systems but is insufficient for accumulation, i.e., for savings and economic growth for its inhabitants. The natural capital of the Balcanes village includes permanent access to the forest, water, fishing, and crops, which is the main capital available to this village, allowing it to configure and transform the different productive spaces that contribute to food security, health, and economic well-being (Lugo & Jaramillo, 2010).

Similarly, 90 % of producers consume firewood as their primary source of energy to meet their food needs, using it for cooking. They spend less than two hours collecting firewood due to the abundant forest cover in this area. Production is small-scale and consists of family farming, predominately of subsistence crops. The average size of farms or plots is 39 hectares, and the crops that generate income are bananas, cassava, rubber, cocoa, sugarcane, and arazá. At the same time, animal production is dominated by small-scale cattle farming for milk and meat. Finally, the inhabitants of this region maintain fruit trees scattered throughout different areas of their farms, such as guava and others, which they use for their homes.

Meanwhile, regarding the cultivation of copoazú, Dussán and Artunduaga (2019) state that in this Amazonian region of the department of Caquetá, there are 1,500 hectares of copoazú, which have been established through sexual seeds, with high genetic variability, uneven plantations, low productivity, phytosanitary problems, and, at times, a lack of knowledge about the ecosystem services provided by this crop, such as its ability to fix atmospheric carbon. Similarly, this author points out that copoazú producers do not have varieties or hybrids that guarantee production security and product quality.

The population corresponds to the unit of analysis of this study, referring to the participants involved in developing each of the phases and stages that make up the work plan. In line with this, Hernández and Mendoza (2018) argue that the population corresponds to the universe of study on which a response to a specific phenomenon/problem is sought, carrying out in-depth investigation processes. Therefore, the population in this particular case corresponds to the six (6) farmers from Copoazú in the Balcones de Florencia district of Caquetá, who were chosen for convenience as this is a non-probabilistic technique that allows access to the

study participants for the duration of the internship.

In line with this, González (2021) states that non-probability sampling provides the opportunity to establish or select population samples with the explicit intention of studying their reality in depth using previously established parameters, limiting the sample only to the cases required for the research. The researcher intentionally chooses the participants because it is a technique that is used regularly due to the ease of accessing the participating population group within the time or period that the activities described in the internship work plan and the study last.

Type of Research

Considering the purpose of this work, a mixed paradigm is assumed, which not only seeks to quantify data but also enables the analysis and interpretation of specific situations that arise about the perceptions, experiences, and knowledge of the study participants, which in this specific case are the six copoazú producers. Given this, Hernández and Mendoza (2018) describe mixed research as a methodology that involves collecting, analyzing, and integrating qualitative and quantitative data within the same study. This provides a deep understanding that supports assumptions and hypotheses. Similarly, Chávez (2018) points out that using a mixed approach requires implementing a systematic and sequential process to obtain a complete understanding of the phenomenon under study, allowing for the comparison of factors, results, and findings. This enriches the research by triangulating with greater depth, diversity, interpretive richness, and sense of understanding.

The type of research, according to the depth of the object of study, is descriptive; where Valle et al. (2022) state that this type of study involves describing the characteristics of a phenomenon or situation, establishing causal relationships that improve understanding of the subject. In the particular case of this study, descriptive research involves establishing standardized patterns of information on the cultivation of copoazú as an alternative for the inhabitants of this Amazonian region and its possible uses to improve its productive profitability, thereby benefiting the family and community economy. On the other hand, Guevara et al. (2020) state that this type of research provides accurate and detailed representations of the observed facts, answering the research question and thus allowing for an in-depth study of the topic in a natural environment of action/study.

Approach

The research approach followed in this internship is social criticism, as this method allows for research to be carried out through progressive participation with the population under study and to delve deeper into the issues facing the community. In this way, it turns all participants into active actors in the research, leading to a deeper and more dynamic process in which all participants enrich and provide the information necessary for the progress and proper development of the research process (Vera & Jara, 2018). The critical social approach is widely used in qualitative research to achieve self-reflective and critical awareness that allows for analyzing a particular group of people's interests, needs, and requirements. To this end, dialogue, debate, and praxis (theory-practice relationship) are used as the axes of the research, rejecting the belief that human behavior is governed by general laws and maintaining that the social world can only be understood from the point of view of the individuals who take part in the action (Cebotare, 2017).

Therefore, adopting a mixed paradigm under a critical social approach allows for a systematic and critical process that embraces the objective vision provided by the quantitative part and the subjective vision offered by the qualitative part, merging into a method that encompasses a large number of elements and information to answer the research question outlined in this study.

The research method used in this internship study is deductive, which uses thinking that ranges from more general and logical reasoning based on principles to a specific fact (Reyes et al., 2022). This logical method concludes with a series of principles and presupposes that the solution lies within the principles themselves. Similarly, Espinoza (2018) indicates that the advantage of using the deductive method as a research method is that it is one of the most effective for testing hypotheses, as it allows for the explanation of causal relationships between concepts and variables, generalizing the research results to a certain extent, and measuring data quantitatively, which is faster and more effective.

Data collection techniques

- Interview: according to Piza et al. (2019), the interview is a beneficial technique for qualitative research because it collects data by creating an instrument that uses questions to gather data and obtain in-depth information. Similarly, Conejero (2020) states several types of interviews, the most notable of which are unstructured, structured, and semi-structured. In this case, the interview is semi-structured with seven (7) open-ended questions, grouped by topics or categories based on the study's objectives and the literature on the subject.
- *Survey:* Feria et al. (2020) point out that surveys, a widely used technique in the field of research,

use qualitative approaches to obtain and process data quickly and effectively. In addition, Tafur (2020) suggests that the objective of this technique is to collect data that will be analyzed later, which involves establishing standardized or semi-standardized open-ended and closed-ended questionnaires in a population sample. In this case, surveys with 10 closed-ended questions in a semi-standardized format will be conducted to achieve and fulfill the objective.

Research analysis techniques

The measures of central tendency that allow for the synthesis and analysis of the information in this study, collected through surveys and interviews, will be categorized, tabulated, graphed, interpreted, and analyzed. In addition, tools such as Microsoft Excel will be used to systematize the data; the results will then be compared with the theoretical and conceptual contributions established in the document's frame of reference. In line with these approaches, Calduch (2019) states that the analysis plan for this type of study uses descriptive and inferential statistics, which allows for detailed and accurate observations in the case of surveys. However, the interview will be conducted through data triangulation, meaning the data will be coded according to categories. Then, graphs will be established, interpreted, and discussed based on content analysis.

Data from producers were collected using a seven-question interview. The information was entered into a program called ATLAS.ti 23, where it was organized in a specific order. We began with plain text summarizing the most important points collected. In the exploratory analysis, we extracted the information cloud. Next, we moved on to the network diagram and finally to the Sankey diagram to obtain the correlation diagram.

RESULTS AND DISCUSSION

The analysis of the first graph (figure 1) reveals an integral connection between the key elements of the study on the technical management of copoazú cultivation in Balcones Village. The "University" plays a central role, contributing both in "Contribution" and "Training." The strategic interaction between these components suggests the significant influence of the institution in the implementation of training programs. "Training" emerges as a crucial component, linked to "Knowledge" and "Satisfaction," demonstrating that training is the leading cause of acquired knowledge and contributes significantly to producer satisfaction. Taken together, these findings highlight the university's strategic importance in managing copoazú cultivation, supporting previous ideas and highlighting the relevance of satisfaction in practical learning.

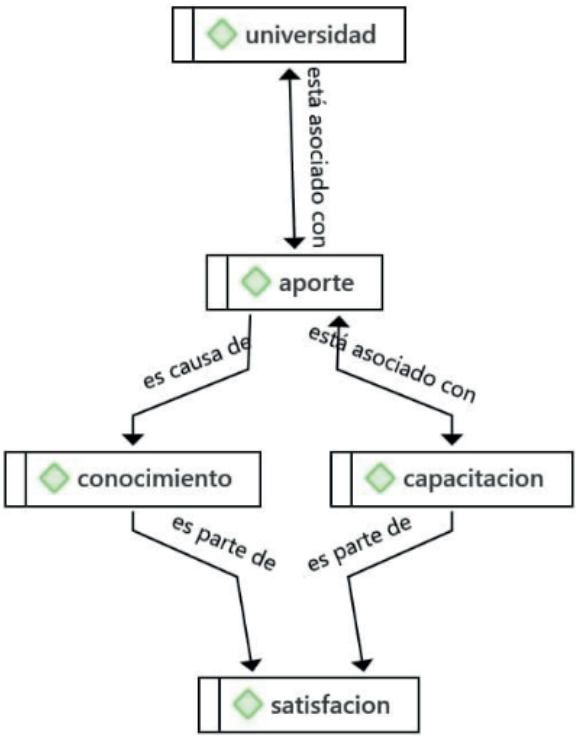

Figure 1. Findings established with the application of the interview according to the coding

The graph analysis shows an integral connection between the key components of the study on the technical management of copoazú cultivation in Balcones Village. The initial rectangle, "University," represents the educational institution that plays a fundamental role in this process. Its contribution is divided into two main

dimensions: "Contribution" and "Training."

The "Contribution" relationship is established through a double-arrow connection with both "University" and "Training," suggesting that the university contributes significantly to both aspects of the study. In particular, the connection with "Training" highlights the direct influence of the academic institution in implementing specific training programs.

For its part, "Training" is presented as a crucial component, with two additional dimensions: "Knowledge" and "Satisfaction." The "Knowledge" relationship indicates that training is the main cause of the knowledge acquired by producers in the Balcanes village regarding copoazú cultivation. This connection reflects the effectiveness of training programs in transferring relevant technical knowledge.

The relationship between "Training" and "Satisfaction" reveals that both the knowledge acquired and the training process itself contribute significantly to producers' overall satisfaction. Both aspects, "Knowledge" and "Training," converge in the final box, "Satisfaction," thus highlighting the importance of these elements in the broader context of the research.

The graph illustrates a coherent chain of events, where the university contributes through training, generating knowledge, and ultimately positively influencing the satisfaction of producers in the Balcanes village's technical management of copoazú cultivation. This analysis highlights the strategic interconnection of key elements, providing a deeper understanding of the dynamics involved in the training process and its impact on participants.

The assertion that the university plays a fundamental role in the technical management of copoazú cultivation aligns with the ideas of Chaparro and López (2017), who highlight the importance of institutions in continuous improvement and efficient training. The bidirectional connection between "University" and "Training" suggests that the institution provides resources and actively influences the implementation of specific training programs. Albarracín et al. (2019) argue that studies on the effectiveness of training support the idea that training led by institutions significantly impacts participants.

The representation of the "University" as the starting point highlights its fundamental role in the technical management of copoazú cultivation in the Balcanes village. This aligns with the idea that institutions, as mentioned in Chaparro and López (2017), are key to continuous improvement and educational change in the agricultural sector.

The double arrow connection between "University," "Contribution," and "Training" indicates a significant contribution by the university in both aspects. "This interconnection supports the notion that the institution not only contributes resources but also actively influences the implementation of specific training programs" (Stes & Petegem, 2015). The existing literature has highlighted the crucial role of universities in education and training, emphasizing their ability to influence the design, implementation, and evaluation of training programs that respond to the needs of participants and promote the development of relevant skills and knowledge. The convergence of "Knowledge" and "Training" in "Satisfaction" highlights the relevance of these elements in the broader context of the research. "Producer satisfaction becomes a key indicator of the success of the training process, which is consistent with the literature that emphasizes the importance of satisfaction in learning and practical application" (Salgado, 2015).

The analysis of the technical management of copoazú cultivation in the Balcanes village highlights the central importance of the "University" as a key agent. This entity contributes significantly through "Training" and "Contribution," influencing both the knowledge acquired and the satisfaction of producers. The two-way connection between the university and training supports the idea that it provides resources and actively influences the implementation of specific training programs, as supported by the literature. These findings reinforce the relevance of collaboration between institutions and agricultural communities to achieve a positive and sustainable impact on the technical management of copoazú cultivation.

The analysis of the second graph (figure 2) on copoazú cultivation in the Balcanes village highlights the essential connection between efficient "Use" and crop development, revealing a complex network of interrelationships. "Cultivation" emerges as a central component, influencing historical evolution and closely associated with the "Tasks" necessary for its maintenance. The critical node "Tasks" branches out into key aspects such as "Fertilization," "Impacts," and "Maintenance," demonstrating its direct impact on the overall management of the crop. This comprehensive approach, supported by the literature on sustainable agriculture, underscores the importance of proper management from the outset and highlights agricultural tasks as fundamental to the sustainability and quality of copoazú production in Balcanes.

The second graph's analysis reveals a complex network of interrelationships that sheds light on various aspects of copoazú cultivation in the Balcanes village. The starting point, "Use," establishes a crucial link with "Cultivation," suggesting a direct connection between efficiency in use and crop development.

"Cultivation" emerges as a central component with two significant dimensions. The first, 'Is caused by,' establishes a connection with 'History,' suggesting that the way cultivation is carried out influences the historical evolution of this agricultural practice. The second dimension, "Is a property of," connects "Cultivation" with

"Labor," highlighting the close association between the nature of copoazú cultivation and the labor required for its maintenance and optimization. "Labor" becomes a crucial node that branches out into three essential aspects of cultivation.

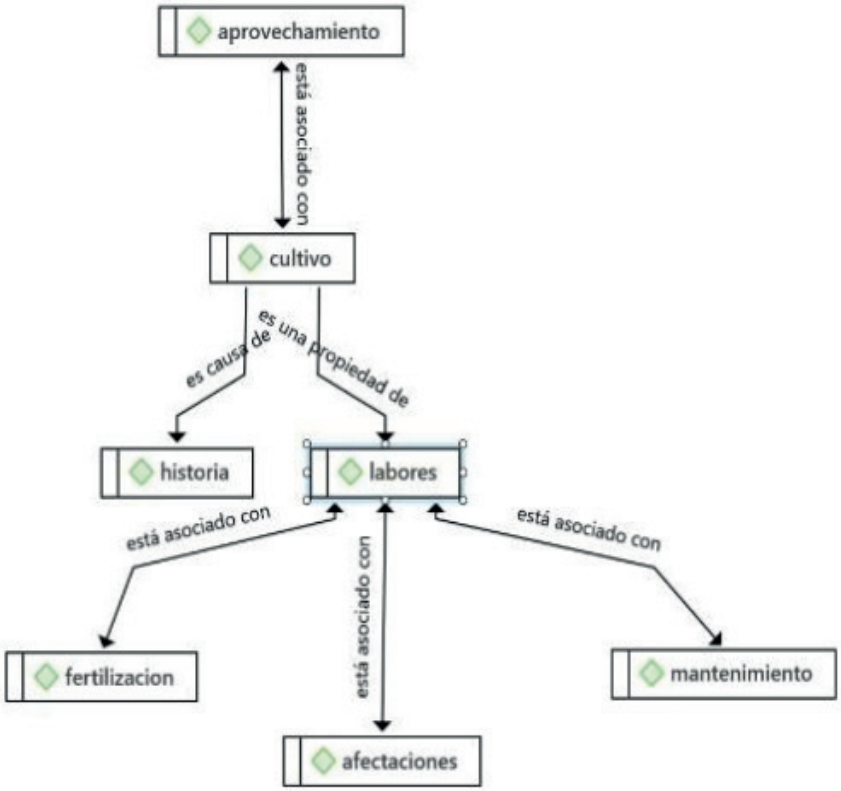

Figure 2. Findings in relation to the coding of the Copoazú crop

The connection "Is associated with" to "Fertilization" highlights the importance of labor in fertilization processes, indicating an interdependence between these agricultural practices. Simultaneously, the "Associated with" connections to "Impacts" and "Maintenance" underscore the direct influence of labor on impact management and the overall sustainability of the crop. This analysis reveals an intricate network of relationships where initial utilization translates into specific cultivation practices, which in turn influence the evolutionary history of the crop. As a central component, agricultural practices directly impact crucial aspects such as fertilization, impacts, and maintenance. This comprehensive approach provides a deep understanding of the interconnected factors that define the copoazú cultivation environment in the Balcanes village, providing a solid foundation for future management and development strategies.

The connection between "Utilization" and "Cultivation" highlights the importance of efficient utilization for crop development. "This supports the notion that proper management from the outset has a positive impact on crop evolution, as suggested by the literature on sustainable agriculture" (Revista Campo Sureño, 2019). The existing literature on sustainable agriculture emphasizes the importance of resource use efficiency, including the appropriate use of inputs such as water, soil, and fertilizers, to ensure the long-term sustainability of cropping systems. The "Causes" relationship between "Crop" and "History" suggests that how a crop is grown influences its historical evolution. "This finding is consistent with the idea that agricultural practices can have a lasting impact on communities and their activities" (Sinchi, 2022). The assertion that how cultivation is carried out influences its historical evolution is in line with the idea that agricultural practices can have a lasting impact on communities and their activities. The central importance of "Labor" is evident in its connection to "Fertilization," "Affectations," and "Maintenance."

"This supports the notion that agricultural laborers are fundamental to effectively managing critical aspects such as fertilization, affectation management, and overall crop sustainability" (Agriculture, 2023). Cultural practices are maintenance and care activities carried out throughout the production of any plant, whether in open fields or protected agriculture. These activities offer greater efficiency in the regulation and application of nutrients, which implies the correct use of resources such as water and fertilizers and low maintenance costs. It is also possible to obtain more plants and higher quality production. Irrigation, nutrition, staking, pruning, and thinning are some cultural practices that influence the effective management of critical aspects of cultivation.

The analysis of the second graph on copoazú cultivation in the Balcanes village highlights the crucial importance of efficient use, which is directly linked to crop development. The connection between "Crop" and "History" suggests that how a crop is grown influences its historical evolution, supporting the idea that agricultural practices have a long-term impact. The central node "Tasks" branches out into key aspects such as "Fertilization," "Effects," and "Maintenance," highlighting the direct influence of tasks on the overall management of the crop. This comprehensive approach provides a solid foundation for future management strategies, supported by existing literature on sustainable agriculture. Overall, it highlights the importance of an efficient start and agricultural practices to ensure sustainability and quality in copoazú production in the Balkans.

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AUTHORSHIP CONTRIBUTION

Data curation: Brayan Stiven Calderón Trujillo, Verenice Sánchez Castillo.
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ANNEXES

Appendix A. Interview application

Bolívar farm, Balcanes village. Interview with Mr. Wilmar, son of Mrs. Blanca

1. How long have you been growing copoazu?

A: We have been harvesting the crop for about a year and a half to two years, and the crop is 17 years old.

2. What cultural practices do you identify as necessary for the cultivation of copoazu and how do they benefit its optimal development?

A: Cultural practices are equivalent to cleaning, organizing the crop, applying fertilizers, pruning, and removing shade, as it is a crop that had been abandoned.

3.What were the main constraints you encountered in implementing your crop?

A: In terms of constraints in implementation, they would be abandonment and neglect, since the crop was planted by my grandparents and my grandfather was alone and they had no labor.

4. How do you think the implementation of a training plan could improve the quality or quantity of your copoazu harvest?

A: The benefit is having it well organized according to the plantation's needs, which improves the quality and quantity of the harvest and boosts morale because it makes you happier when the crop responds well.

5. Have you received any training in the past? Do you feel that this training was helpful for your copoazu cultivation?

A: To be honest, Brayan, so far what I have learned and what I have achieved and what has encouraged me are the visits you have been making, starting with Professor Diego and the university students who have visited us. I think those have been the only lessons or workshops or learning experiences because I had not had any training before, and thank God, as I have always told everyone, 10 out of 10 points.

6. Regarding pests and diseases, which ones do you know and have you identified on your property?

A: From what I have learned from you, I will name two, which are witch's broom and monilia. I call it fungus, and that is why I say that I have learned about it because when I saw it on the crop, I said, "It has freckles, or it has chills." Day after day, you learn, and you also look at your crops and see that those ants are bothering them. According to what I've read, they're not good for this crop. Another thing I call a disease is termites because they eat my trees.

7. What important aspects do you think should be explored or addressed in a training plan on copoazu cultivation?

A: Look, to be honest, in your case, personally, I haven't had any problems because I'm one of those people who likes to be evaluated, and I like to evaluate, and I'm one of those people who asks a lot of questions. I ask one thing and then another, But the university students have been excellent at explaining things, and I believe that if you want to learn, you have to ask questions, because that's how you learn. I don't think there's a lack of focus in any area, and as I've told all your colleagues, the Bolivar farm is always open to you.