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THE CHALLENGES FACED BY PRODUCERS IN THE PRODUCTION OF AMAZONIAN ROBUSTA COFFEE IN TANGARÁ DA SERRA – MT

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ABSTRACT

Coffee production is one of the main activities in the world, generating about 100 million jobs directly and indirectly. In 2022, 17.97 thousand bags of coffee production of the Amazonian robusta species were estimated in Brazil. With the considerable importance of coffee cultivation for the country, as well as for the municipality of Tangará da Serra - MT, it is relevant to identify the main challenges faced by Tangara's producers in the production of this type of coffee. In order to enable solutions to the problem exposed, the proposal was to characterize the producers of Amazonian robusta coffee in Tangará da Serra - MT, identify the difficulties that stand in the way of production and compare them to those recorded in 2019 with those faced in 2023. For the study, a qualitative methodological approach was used, which enables a given perception of reality, with an exploratory research strategy for greater familiarity with this theme little explored in the municipality. The careful description sought to identify the obstacles faced by local coffee producers, and nineteen semi-structured interviews were conducted with these workers for data collection. The results showed that they face various challenges in the production of Amazonian robusta coffee, since they worked individually, without ties to coffee associations or cooperatives, a factor that limits the representativeness of the crop, such as the lack of adequacy to the regime that manages water resources when the irrigation method is used for the crop and the succession to the coffee activity that is shown as an obstacle to be overcome, since it is the transfer of power to the next manager of the business. It is evident that this production

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in Tangaraense tends to grow since there are new entrants to the culture with crops in formation.

Keywords: Coffee growing. Robusta Amazônico. Challenges.

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INTRODUCTION

World coffee production in the 2022/2023 periods reached a harvest of 168.2 million 60kg bags, assuming 178 million bags for the 2023/2024 coffee year, with Brazil being the main driver of production with 8.4% of the combined production in the Americas of 100.5 million bags (CAFÉ, 2024).

In Brazil, coffee production for the third survey of 2024 was estimated at 54,789.4 million 60kg bags, of which 39,585.2 thousand were of the Arabica species and 15,204.2 thousand bags of Amazonian robusta (*Coffea Canephora),* popular for the *conilon* variety. As for exports, it increased by 40.1%, surpassing the record of 43.9 million bags (CONAB, 2024).

The Arabica coffee cultivation regions are predominant in the states, Bahia, Goiás, Minas Gerais, Espírito Santo, Rio de Janeiro, São Paulo and Paraná, totaling production of 40,749.2 thousand bags of the species in the January 2024 harvest, along with the other small producing regions. The cultivation of the Amazonian robusta species is present in the states of Rondônia, Bahia in the Atlantic region, Mato Grosso, Minas Gerais in the Zona da Mata and North, Amazonas and Espírito Santo, obtaining a production of 17,333.0 thousand bags processed in the same period (CONAB, 2024).

Specifically in the State of Mato Grosso, coffee production occurred in the North and Northwest regions of the State, covering an estimated 12,591 thousand hectares of coffee cultivation in 2018. Since in the periods from 2008 to 2011 the species produced in the state was *Coffea* arabica, in 2018 the species corresponded to only 0.9% of the total estimated in the harvest, possibly declining due to reflections of old bearer plants with low productivity, inadequate management, variable price paid to the producer, water deficits, among others. However, currently the predominant variety is the Amazonian robusta species (SEAF, 2019, p. 39-40).

The variety of Amazonian robusta coffee in Mato Grosso covers small and medium-sized producers, family farmers in the regions of Colniza, Juína, Cotriguaçu, Aripuanã, Nova Bandeirantes, Rondolândia, Alta Floresta, Nova Monte Verde, Tangará da Serra and Carlinda, considering only the municipalities participating in the Pró Café Mato Grosso project. The adhesion of producers to the cultivation of this new species is due to the climatic factors of the region, considered favorable or suitable for the variety (SEAF, 2019 p. 41-42).

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In Tangará da Serra, the production of Amazonian robusta coffee occurs by settled families and rural producers, being an area with intense aggregation of new lands by rural settlement policy (SEAF, 2019). It occurs timidly, as its production has been declining over the years, due to the numerous difficulties faced by producers (ENCAFÉ, 2019).

For the specification of the research theme and knowledge about it, the study is delimited from the theme of the numerous difficulties faced by producers of Amazonian Robusta coffee within the gate, thus enabling the deepening of the knowledge of such a situation in the region of Tangará da Serra, evaluating its peculiarities objectively.

In relation to Brazil, the biggest challenge for the coffee sector is the economic sustainability of the production chain, since producers tend to dilute their production gains with the production chain and its increasingly demanding consumers. Factors that imply the search for certifications that aim at quality standards in production processes, thus adding value to the product. Another limiting factor for coffee cultivation is the issues associated with taxation, tariff and non-tariff barriers and logistics (Miarelli, 2006).

In the regions of Viçosa, Triângulo, Lavras, Governador Valadares and Montes Claros Minas Gerais, the main difficulties faced in the coffee crop by producers are the shortage of qualified and committed labor, the total management of the business including the storage of beans, the lack of security in the field, energy supply carried out by the concessionaire intermittent and poor quality, the high costs of agricultural inputs and implements, the lack of knowledge of the market, the lack of articulation for the sale of grains directly or exported, and the disunity of the regional group of producers, factors that accentuate a weakening of cooperatives such as the demotivation of the producer (Novaes, 2021).

In the State of Rondônia, the main challenges faced by coffee producers are the impasses involved in access to credit, the lack of professionalized technical assistance for the field, a flawed political regime in relation to the coffee sector, the high costs with inputs and labor, factors that reflect on the price practiced, compromising the producer's income (Rosa Neto, 2005).

The main challenges faced by coffee producers in the State of Mato Grosso are the failures in the transfer of concise information by institutional organizations to the segments that make up the link of the coffee production chain, the production systems applied, the difficulties of access to the market by producers and the relationship with the members of the production chain. These factors hinder the good performance of the coffee crop,

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causing difficulties in forming strategies that contributed to the promotion of coffee production in the State, consequently reducing the area planted with the crop (SEAF, 2019).

The study carried out by EMPAER, Production System 7 (2005), highlights that the main difficulties of Mato Grosso producers in the production of coffee in the regions of Paranaíta, Colniza, Juína, Alta Floresta, Nova Monte Verde, Nova Bandeirante and other smaller areas of the Alta Floresta region, are originated by the length of the poles, which compromises the commercialization of beans due to the high production costs, another factor is the fragile relationship between producers and the inferior quality of the coffee produced, factors that devalue the prices charged by producers (Vieira *et al*., 2005).

In Tangará da Serra - MT the difficulties faced by producers are the taxes for family farming, the challenges of commercialization, the lack of minimum structure on the properties, the lack of knowledge of the new plant that bears Amazonian robusta coffee, and the lack of information on the main costs to invest in the crop. It is also known that coffee consumption in the municipality of Tangará da Serra is not locally produced, there is a slowness on the part of regulatory agencies regarding the guidance for obtaining the Provisional Operating Authorization (APF), difficulty in accessing credits and low articulation of common interests in groups by family farmers (ENCAFÉ, 2019).

The theme addressed in the research comprises the production of coffee of the Amazonian Robusta species in the municipality of Tangará da Serra - MT. The study sought to identify the challenges faced by producers in the production process, comparing them to the challenges listed by producers in the I ENCAFÉ report (2019).

The research approach is expressive for the coffee culture as well as for the University of the State of Mato Grosso, which aims to partner with the local community where it is inserted, considering the peculiarities of each demand, in order to have its professional resources to assist in the search for solutions to the problems faced by the small coffee farmer. Therefore, the general objective of this research was to diagnose the main challenges faced by Amazonian robusta coffee producers in Tangará da Serra – MT. As specific objectives, the characterization of Amazonian robusta coffee producers, identification of production challenges and comparison of the problems listed in 2019 with the challenges posed in 2023 were selected.

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COFFEE PRODUCTION CHAIN

The production chain is a composite of interconnected operations that are established before the gate, during and after the gate and contributes to the production on the farm, integrated by the transportation of agricultural provisions, suppliers of inputs and labor, storage, processing, distribution of cultivated products and the final consumer (Prado *et al*., 2021).

However, when observing the macro-segment of the production chain, it can be divided according to the type of product and objective of the analysis, obeying three segments: (I) Commercialization, which corresponds to the companies in contact with the customer in the production chain, such as the domestic market and companies responsible for distribution logistics, (II) Industrialization, which involves those responsible for transforming the raw material into the final product, which can be a family unit or agroindustry, and (III) Production of raw material that needs suppliers of raw material for the agricultural production process (Batalha, 2021).

For a better understanding of a production chain, Figure 1 shows the representation of the coffee production chain so that the processes in the rural environment, which is the scope of the study, can be observed in detail.

According to Neto and Menck (2014, p. 149) "the coffee production chain is responsible for the generation of more than eight million jobs in the country, providing income, access to health and education for workers and their families".

Economic activities integrated with the market, technology, and capital are operations linked to each other as a set of commercial and financial relationships that establish a flow of exchange between suppliers and customers, valuing the means of production and ensuring the articulation of operations (Batalha, 2021).

Understanding the coffee production chain is relevant because it is one of the main food and beverage segments in the world, responsible for generating about 100 million jobs directly and indirectly (Trauer *et al*., 2017).

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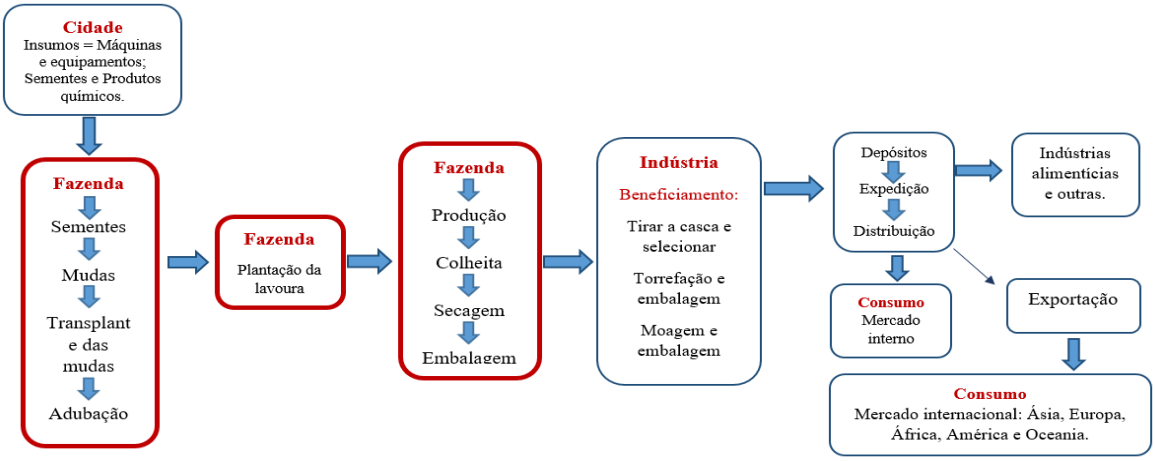
Figure 1 - Coffee production chain.



Source: Adapted from Santos *et al*., (2020, p. 12).

The coffee production chain involves a series of interconnected operations ranging from the production of raw material to the final commercialization, contributing significantly to the economy and rural development.

In Brazil, the production chain generates about eight million jobs, with almost 1,900 municipalities producing coffee growing, employing an estimated 287 thousand people responsible for the economic development of the municipalities (Souza, 2018).

COFFEE PRODUCTION IN THE STATE OF MATO GROSSO

In 2016/2017, coffee production in the State of Mato Grosso, due to climatic problems such as water *deficit* that affected the producing regions, comprised a planted area of 15.8 and 11.2 thousand hectares, harvesting 84.5 thousand bags of coffee processed in 2017 (SEAF, 2019).

In 2023, the production of Amazonian robusta coffee in Mato Grosso was 260.3 thousand bags processed, highlighting the adoption of more sustainable management practices, more prolific clonals and the efficient use of resources. In January 2024, the harvest was estimated at 263.7 thousand bags of processed coffee. This fact is due to the adhesion of new areas that will go into production, to the supply of seedlings, fertilizers and irrigation kits promoted by the State and municipalities (CONAB, 2024).

The production of coffee culture brings together several structured sectors performing in a systemic way different functions for the same purpose. They are the agents that supply agricultural inputs, directly linked to the coffee producer, the industry that transforms the beans, with an intrinsic relationship with roasters and cerealists, and the

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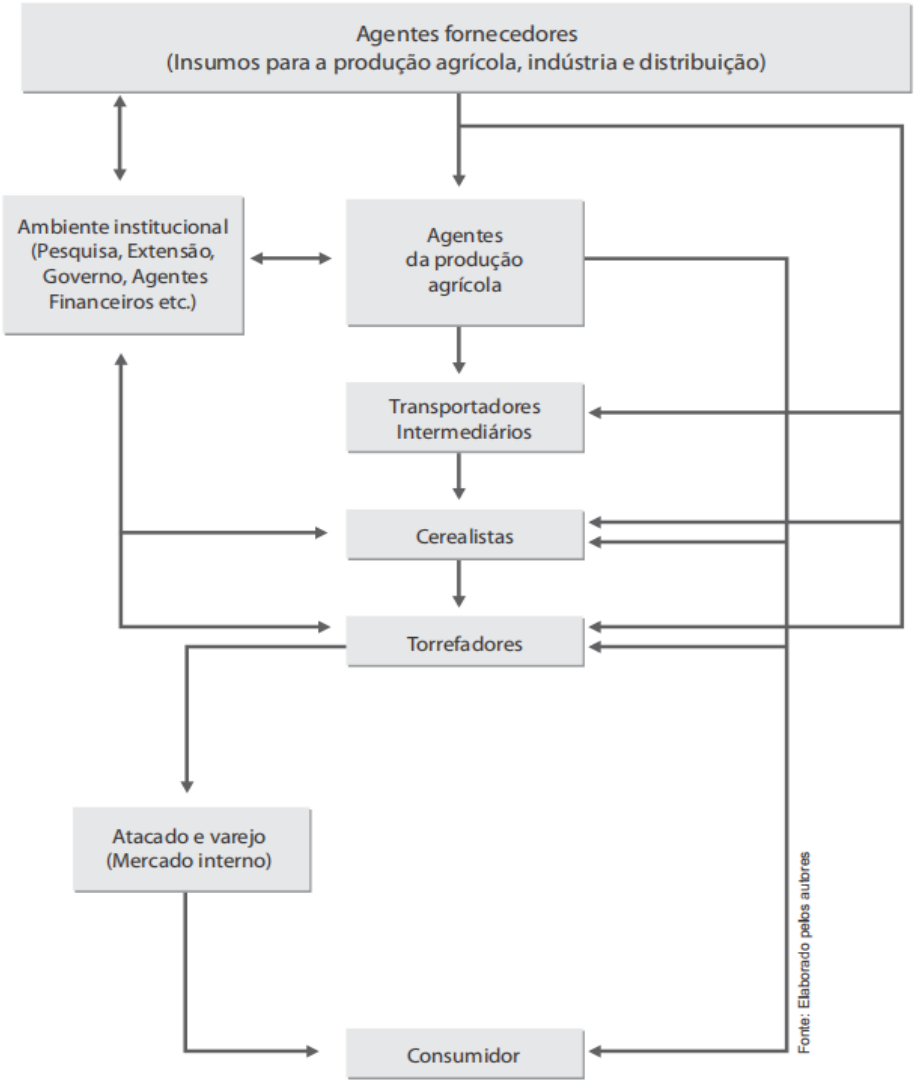
distributors with a direct and indirect relationship with the trade up to the final consumer. All production and transformation agents are intrinsically linked to institutional environments, whether inspection, financial, research and extension.

The activities that make up the coffee production chain in Mato Grosso are represented in Figure 2, and comprise the agents from coffee agriculture, from the field to the final consumer.

Figure 2 - Coffee agro-industrial chain in Mato Grosso.



Source: SEAF (2019, p. 84).

The importance of the coffee production chain is highlighted, from the main agents involved in the supply of inputs to final consumption. The supplying agents, responsible for supplying agricultural production and industry, interact with agricultural production agents, who depend on the institutional environment for support in research, extension, and

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government policies. After production, the coffee passes through intermediate and cereal conveyors, until it reaches the roasters, who prepare the product for the market. Then, the coffee is directed to wholesale and retail, where it finally reaches the consumer. This integrated structure is essential to ensure efficiency and quality throughout the chain, promoting the development of the coffee sector in the state.

The coffee production chain in Mato Grosso plays an important role for the regional economy, promoting rural development and job creation in various stages of its production. The constant growth of production, combined with the search for innovations in management and the adoption of new technologies, highlights the potential of Mato Grosso in the national coffee scenario. With a well-defined organizational structure, the sector is increasingly strengthened, contributing to the appreciation of Amazonian robusta coffee and consolidating the state as a relevant producer and exporter. The integration of the agents in the chain, from the production of inputs to the final commercialization, reflects the commitment to quality and sustainability, factors that are essential to maintain competitiveness in the coffee market.

LIMITATIONS IN COFFEE PRODUCTION

Agriculture is a practice that depends on climatic factors to thrive, such as temperature, the amount of rain that falls in the cultivated region, soil moisture, and solar radiation. Climate imbalance is the main limiting factor for coffee production, as it can compromise the development of the coffee-bearing plant, due to its low hydraulic conductivity (Pinho, 2021).

Natural *water deficit* compromises the absorption of nutrients and water by the carrier plant even when under irrigated conditions, limiting the absorption of CO2 for photosynthesis, used to build new cells and tissues, compromising the growth and productivity of the coffee carrier plant (Pinho, 2021).

As for the limitations with the scarcity of water in the dry season, the producer resorts to the irrigation method since without water it is not possible to plant. The method depends on the supply of water from rivers or reservoirs, however it is necessary to train new adherents to the irrigation method as well as producers who already have it, so that the use of water is adequate (Coelho *et al*., 2017).

The high prices and fees with energy when using the irrigation method increases crop productivity, being another limiting factor for the coffee crop, and can represent about

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70% of the variable costs, a factor that compromises the net profit of the annual production, considering that the investment with the irrigation and operation method is high (Silva, 2020).

High air temperatures together with water *deficit* aggravate damage to coffee crops, progressively reducing plant growth, compromising coffee fruit production (Rodrigues *et al*., 2016).

For Matiello (2016), another limiting factor in coffee production is the diseases that affect the plant that carries the coffee, especially rust, which attacks the Amazonian robusta species more aggressively because it is a more crowded planting system, induced to higher yields by irrigation and clonal seedlings. Rust attack occurs more aggressively when there is a water deficit, lack of nutrients for the plant, high temperatures and low air humidity. The disease causes defoliation of the plant and limitation in the production of the next harvest.

Of the diseases that can affect coffee production, Fusarium wilt is also highlighted, which acts especially on the Amazonian robusta coffee species, its appearance in crops is worrisome given its aggressiveness in causing the death of the plant, thus causing losses to the producer (Morais *et al*., 2019).

The limitations imposed on coffee cultivation by climate change can be circumvented with the implementation of agronomic practices such as the use of shading by tree species, soil cover and erosion containment. These techniques make it possible to maintain soil and plant water levels. Another viable alternative is the selection of genotypes that are more resistant to current environmental conditions (Rodrigues *et al*., 2016).

Due to the specific characteristics of the area that the coffee crop needs for planting, the type of soil of the producing property, slope and depth, can become a limiting factor for the coffee crop when the construction of the producing space according to the techniques oriented to the culture and location of the property is not considered (Vieira *et al*., 2005).

Another limiting factor for coffee cultivation is the lack of labor to work in the field, such as the decline of family successors on the properties, factors caused by economic growth and the change of trends towards non-agricultural activities in society and increased production for own consumption. New trends for agricultural activities are the increase in training and qualification with digitalization, average level of education, salary increase of employees, among others. Small producers are often unable to keep up with so many changes, being harmed by the lack of labor in their activities (Balsadi, 2022).

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The taxes that fall on family farming, the challenges of commercialization, the lack of minimum structure on the properties, the lack of knowledge of the new plant that carries Amazonian robusta coffee and the lack of information on the main costs to invest in the crop are important challenges that, if solved, change the conditions of coffee production. It is also known that coffee consumption in the municipality of Tangará da Serra is not locally produced, there is a slowness on the part of regulatory agencies regarding the guidance for obtaining the Provisional Operating Authorization (APF), difficulty in accessing credits and low articulation of common interests in groups by family farming producers contribute considerably to the detriment of this cultivation (ENCAFÉ, 2019).

Regarding production planning, a rural property lives in the context of other rural properties, companies that supply inputs, energy and services and their customers, with the producer often being the manager of the business. For the survival of the business, the producer must consider all the changes in this context, however crises due to lack of planning are caused, and, therefore, the possibilities for irrigation, the adaptation of the chosen carrier plant to the region, its resistance to diseases, market possibility, among other aspects, must be analyzed (Sette, 2008).

Preparing to start a coffee activity consists of making decisions in a programmed way that includes: what to do, why to do it, when it should be done, how much it will cost, how it should be done and where to do it, also considering to whom the production will be sold and identifying the possible threats and opportunities of this environment, as well as the strengths and weaknesses of the property that involves the quality of the land, its infrastructure, viable suppliers of inputs and services, availability of labor for the field and the feasibility of introducing another complementary crop on the property, being ideal to adopt an action plan to define which crop will be planted, thus making the quality of the plant and availability of the seedlings chosen in the market more assertive. Success for the crop also depends on technical and managerial assistance in the planning, implementation and maintenance of the crop (Mesquita *et al*., 2016).

METHODOLOGY

For the perception of a given reality of rural producers in Tangará da Serra - MT in the production of Amazonian robusta coffee, the problem is characterized as qualitative, and "qualitative research includes a set of interpretative techniques that seek to describe, decode, translate and, in another way, apprehend the meaning, and not the frequency, of

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certain phenomena that occur more or less naturally in society", which "aims to achieve a deep understanding of a situation, [...]" (Cooper, 2016 p. 146).

To learn about the theme little explored in the local context, the exploratory research strategy is approached, providing the opportunity to collect data from Tangara's coffee growers through field research. "Exploratory data analysis is a perspective of data analysis and also a set of techniques" (Cooper, 2016, p. 408).

With the objective classified as descriptive, detailed descriptions of the challenges faced by coffee producers were made, knowing the reality and the reasons that impact the cultivation of this crop, since the descriptive structure in studies on organizations applies "[...] organizational structure, personnel policies, production system, marketing processes, relationships with other organizations, etc.", (Gil, 2021 p. 163).

In relation to the researched group, it comprises all coffee producers in Tangara, with a total of twenty-two producers, but with a response from nineteen interviewees, due to their accessibility. Thus, it is classified as census research or population survey, which implies identifying the social structure of the group, discovering the system experienced, based on the survey of socioeconomic and technological data, which can be of a geographical, demographic, economic, sanitary, housing, road, and educational nature (Gil, 2022).

To identify the group of coffee producers, the information was collected from the technical manager of EMPAER, who provides assistance to local properties.

Regarding data collection, a semi-structured interview script was used that "allows a more direct comparison between the answers; the variability of questions is eliminated and, therefore, the variability of answers is assumed to be real" (Cooper, 2016, p. 155), as detailed in the script.

According to Cooper (2016, p. 154), "the interview is the basic technique of data collection in qualitative methodologies, which varies based on the number of people involved, the level of structure, the proximity of the interviewer to the participant and the number of interviews conducted during the research".

The interviews were carried out through the researcher's displacements with partners to the rural properties for meetings with the researched between 03/28/2023 and 04/19/2023 as the observation technique in a complementary way to the information collected. For Cooper (2016, p. 173), "observation qualifies as scientific investigation when it is conducted specifically to answer a research question, systematically planned and

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executed, uses appropriate controls, and provides reliable and valid information about what occurred".

For data analysis, the content analysis technique was applied, a qualitative analysis instrument to evaluate the results of the interviews, giving specific treatment to the answers coming from the producers, seeking understanding for the results of the interviews, the causes of the challenges in production, the antecedents, effects and consequences for the coffee crop as well as for the producer. In short, this technique allowed the elucidation of the narrative structure of texts; the contextualization and interpretation of the meaning of images and sounds of the reality of coffee producers.

RESULTS AND DISCUSSION

CHARACTERIZATION OF AMAZONIAN ROBUSTA COFFEE PRODUCERS

Tangara's coffee production is found in ten regions of the municipality named as: Alto da Boa Vista (Vale do Sol I Community), Nakamura Condominium, Agrovila II (Antônio Conselheiro Settlement), Bezerro Vermelho (Vale do Sol II), São José, São Joaquim Community, Nossa Senhora Aparecida, Gleba Aurora, Linha 12 and Belo Horizonte Community.

In the Alto da Boa Vista region (Vale do Sol I), production is subdivided into four distinct properties. In the Nakamura Condominium region, production is carried out on a property. The region of Agrovila II (Antônio Conselheiro Settlement) is the coffee production carried out in a family group. In the region of Bezerro Vermelho (Vale do Sol II), there is the largest number of coffee-producing properties in the same region, five of which are different.

In São José, coffee production is carried out on two properties. The region of the São Joaquim Community comprises coffee production on one property. In the region of Nossa Senhora Aparecida, it also consists of only one coffee-producing property. The Gleba Aurora region, on the other hand, obtains coffee production on two properties. In the region of Line 12, coffee production is carried out on a property. As the Belo Horizonte Community, similar to the region of line 12, there is also only one producer.

Regarding the similarities of the group analyzed and considering the set of regions of the municipality presented, the coffee producers have an average age of 57 years, with a predominantly male sample, the population is relatively old compared to the estimated life

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of the Brazilian. According to the Brazilian Institute of Geography and Statistics - IBGE (2020), the current life expectancy in Brazil is 73.1 years for men.

This factor is relevant due to the unwillingness of most of the heirs to continue working in the field, a condition highlighted when reporting the current residence of the children mostly in the urban perimeter, however there are two producers with possible successors for the activity who can be prepared for succession in the next 10 years. The marital status is predominantly married and parents of an average of 2 children each individual, being a group of high school education.

The population analyzed has a migratory profile when the Brazilian regional origin of the parents is scored, namely, Northeast (Bahia and Pernambuco), Midwest (Cuiabá, Goiânia and Cáceres), Southeast (Espírito Santo, São Paulo and Minas Gerais) and South (Paraná). The diversity of inherited cultures reflects the family tradition in the coffee culture, with an average of two generations producing coffee or cultivating the coffee culture.

This family tradition in the coffee culture in Tangará da Serra was interrupted and resumed by the producers mostly 2.5 years ago on average, with the exception of four of the pioneers in the local culture who keep producing 31 years on average, that is, currently there has been the replanting of new clonal seedlings more adapted to the climate on the properties and even the formation of new coffee plantations in the region due to political incentive through donations of Seedlings.

The coffee activity is managed on average by two people on each property and is currently not considered the main source of income for coffee producers in Tangará da Serra - MT.

IDENTIFICATION OF PRODUCTION CHALLENGES

Regarding the similarities in coffee production and performance of the group analyzed, the sample mostly does not have links with democratic organizations such as associations or cooperatives, when there is a link the organization is not related to coffee production, but to other crops carried out on the properties such as by link to the location of the property, This factor demonstrates that coffee producers work individually.

This position limits the representativeness of the coffee culture obtained through cooperatives or associations, which promotes the development of the activity, protecting the linked members. The cultural diversity of the producers, presented by the origin of their

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progenitors, can be considered as a challenge for the performance of the sample in the coffee activity by democratic organization.

Regarding the difficulties in the production process, the irrigation method and the shortage of labor for the field are the challenges most pointed out by Tangara's coffee producers. The irrigation method requires efficient equipment for the controlled supply of water as the concentration of water necessary for good flow. Access to water in volume by properties is a limitation, since for irrigated practice it is necessary to invest in an artesian well or access to authorization to withdraw water from rivers or streams, both subject to environmental and regulatory factors.

However, all properties use the irrigation method in the dry season to ensure the health of the coffee bearing plant and its productivity. Of the properties that use the irrigation method, only four have the necessary authorization to control the use of water. The recurrent fact may be caused by the administrative bureaucratization imposed by the regulatory bodies.

Coffee cultivation in fourteen of the properties analyzed is carried out in a non-ecological way. The use of pesticides in coffee plantations is justified to control possible diseases, pests and weeds as well as to promote the increase in the productive capacity of the plant.

With regard to local coffee production, after processing 99% of the beans are sold. Of the local production, 80% is directed to one or two local producers capable of carrying out the agro-industrialization stages from processing to bottling the coffee, when the production of the other producers is purchased after the beans have dried. The sale of grains to another producer and not directly to the customer via local fairs can be considered due to the unfeasibility of transportation costs and stages of agro-industrialization.

Regarding rural technical assistance, two of the properties declared that they did not receive the service. On the other hand, all the others receive rural technical assistance from the public company EMPAER, a service declared to be sufficient by more than half of those assisted. The exchange of experience between producers about coffee growing is perceived in 55% of those surveyed, a relevant factor for the improvement of the practices carried out in the crop.

Regarding the family's future perspectives for working in agriculture, the average from the information exposed in the interviews confirms that continuing the coffee activities is the proposal of the heirs, a reality that drives the coffee culture in the municipality of

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Tangará da Serra - MT as the awakening of future generations to the local coffee production.

In relation to the challenges listed above, irrigation in production has several segments to form an irrigation system, such as motor, pump, pipes, connections and emitters, objects that are usually costly for the producer, however it is possible to adapt the emitters thus making the irrigation system accessible with the same success as conventional systems, when water is used with due care (Coelho *et al.*, 2017).

According to Coelho *et al.* (2017), to establish an irrigation system, technical guidance is needed that designs the irrigation system according to the size of the property area, distance from the planted area to the river or dam, and the measurement between the level of available water and the plantation. Technical guidance is exercised by municipal, state, and federal government agencies, the private sector and irrigation material stores, however in the municipality of Tangará da Serra - MT there is a shortage of technical assistance for irrigation, as referred to by local coffee producers.

The attack of diseases in the coffee crop causes damage to the plant and decline in production, and there may be a need to replant the crop, so it is essential to develop epidemiological studies of the ducks in the system in question to propose management strategies that avoid such damage. The management of coffee diseases can be made possible by the use of more resistant clonal varieties (Morais *et al.*, 2019).

Regarding the management of the coffee crop and its characteristics, it is essential to observe the area for planting, considering the decline of the soil, its drainage, depth, natural fertility of the soil, among other preparations for the implementation of the crop (Vieira *et al.*, 2005).

For the Amazonian robusta coffee species, pruning the coffee-bearing plant is an essential practice, with the objective of renewing the plant structure, regulating the harvest, reducing the size of the plant, eliminating excess buds or stems, eliminating unproductive branches, phytosanitary control, better performance in the harvest, possibility of mechanized harvesting, good management practice and better branch/leaf ratio to increase productivity and production quality (Vieira *et al.*, 2005).

Regarding the public incentive for coffee cultivation, the property must be in accordance with the standards established by the responsible culture incentive program, such as conservation and phytosanitary practices, proof of technical guidelines established for the crop, proof of tax regularity, acceptance of the minimum price for the

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commercialization of the grain listed by the public agency, among others, however, the program to encourage coffee cultivation in the State of Mato Grosso was made unfeasible by the State Legislative Assembly (Mato Grosso, 2000).

Regarding the lack of labor for the countryside, there was a significant decrease of 1.4 million persons with the workforce between the years 1996 and 2017. The activity has undergone modifications over the years due to the automation and mechanization of management, such as the reduction in the participation of young people and the reduction in the role of family members in the activity (Balsadi, 2022).

With regard to the high prices and energy rates with the use of irrigation in the dry season, the expenses can represent 70% of the variable costs of agriculture according to the performance of the motor pump and operation in the peak period from 6 pm to 9 pm, when the taxation is higher. However, it is possible to relocate the task to off-peak hours and take advantage of discounts and taxes levied on rural irrigation granted by the energy concessionaire (Silva, 2020).

COMPARISON OF THE CHALLENGES LISTED IN 2019 WITH THE CHALLENGES LISTED IN 2023

For the knowledge of the productive cycle of the coffee culture in the municipality of Tangará da Serra - MT, as well as the current production model, production planning, cost records, legal requirements, product quality, all production management and commercialization of coffee in the region, an activity linked to the extension project "Coffee with Research" was carried out at UNEMAT where the students of the administration course of the 2nd module class together with the professors promoted the I ENCAFE event in 2019. This activity generated a public report to promote coffee cultivation, filed with the local Secretariat of Agriculture, Livestock and Supply (SEAPA) and the State Secretariat of Family Agriculture (SEAF).

During the event, coffee producers listed various challenges faced in the coffee production process.

Chart 1 shows the comparison of the challenges in coffee production listed in 2019 as well as the challenges listed in 2023.

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Chart 1 - Comparison of the challenges of coffee production in Tangará da Serra – MT between the year 2019 and 2023

Challenges in coffee production in Tangará da Serra - MT related by producers	Related challenges 2019	Related Challenges 2023
1- The coffee consumed in the municipality is not locally produced, 60% of the beans are purchased in Minas Gerais and 20% in the regions of Juína and Cotriguaçu, operating below the productive capacity	X	
2- Slowness on the part of regulatory bodies, regarding the guidance for obtaining the Provisional Operating Authorization (APF), making access to credit difficult	X	
3- Low articulation of common interests in groups by family farmers	X	
4- Fiscal and tax issues, family farming is still taxed	X	
5- Challenges in marketing, most family farming producers in the region do not have the structure to process coffee, so they outsource the process	X	
6- Lack of minimum structure on the properties, lack of water for irrigation	X	X
7- Lack of knowledge of the new "Amazonian robusta" plant	X	X
8- Lack of information on the main costs to invest in this crop	X	
9- Challenges in correcting the land for planting		X
10- Insect and pest attack		X
11- Lack of public support with machinery		X
12- Lack of manpower for the field		X
13- Lack of technical assistance for irrigation		X
14- Lack of scientific field research on soil such as soil moisture, among others		X
15- Inconstant technical visit		X
16- High prices and energy bill rates with the use of irrigation		X

Source: Survey data (2023).

It is demonstrated that the difficulties with the irrigation method remain in the coffee production in the municipality, such as the lack of knowledge with the new species of Amazonian robusta coffee cultivated. The factors are determinant for production, since the plant is dependent on moisture throughout the life cycle, as planting and management require specific techniques for the clonal Amazonian robust species suitable for the climate of Tangará da Serra - MT.

It is understood that some challenges listed in 2019 are not repeated in 2023, as items 6 and 7 still remain a challenge for coffee producers. In the 2023 survey, new challenges in coffee production arise, with topics 9 to 16 listed in the comparative table below. It is assumed that challenges 1 to 5 and 8 of 2019 not related in 2023, have been solved for producers.

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As for the limitations imposed on coffee cultivation at the national level and its regions, it is possible to identify, in Chart 2, the challenges of production in the coffee sector together. What they have in common are the challenges with high costs of agricultural inputs and implements demonstrated in the southeast and north regions of the country, such as the disunity of the group of regional coffee producers evidenced in the southeast and midwest regions of the country.

Chart 2 - Challenges in coffee production at the national, regional and municipal levels.

Challenges in coffee production	Brazil	Southeast Region	North Region	Midwest Region	Tangará da Serra - MT
1- The shortage of skilled and committed labor,		X			
2- The total management of the business including the storage of grains,		X			
3- The lack of security in the countryside,		X			
4- The supply of energy carried out by the intermittent and poor quality utility,		X			
5- The high costs of agricultural inputs and implements,		X	X		
6- The lack of knowledge of the market,		X			
7- The lack of articulation for the sale of grains directly or exported,		X			
8- The disunity of the regional producers' group,		X		X	X
9- The impasses involved in access to credit,			X		
10- The lack of professionalized technical assistance for the field,			X		
11- Political regime flawed in relation to the coffee sector,			X		
12- High labour costs,			X		
13- The failures in the transfer of concise information by institutional organizations to the segments that make up the link of the coffee production chain,				X	
14- The production systems applied,				X	
15- difficulties in accessing the market for producers,				X	
16- The relationship with the members of the production chain,				X	
17- The length of the poles that compromises the commercialization of grains due to the high production costs				X	
18- The inferior quality of the coffee produced				X	
19- Taxation of family farming					X
20- The challenges of commercialization					X
21- The lack of minimum structure on the properties, such as the lack of water for irrigation					X

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22- The lack of knowledge of the new "Amazonian robusta" coffee-bearing plant					X
23- The lack of information on the main costs of investing in culture					X
24- The slowness on the part of regulatory bodies regarding the guidance for obtaining the Provisional Operating Authorization (APF)					X
25- Coffee consumption in the municipality is not locally produced					X
26- The low articulation of common interests in groups by family farmers					X
27- Challenges in correcting land for planting					X
28- Insect and pest attack					X
29- Lack of public support with machinery					X
30- Lack of scientific field research on soil such as soil moisture, among others					X
31- Inconstant technical visit					X
32- High prices and energy bill rates with the use of irrigation					X
33- The economic sustainability of the production chain	X				
34- The issues associated with taxation, tariff and non-tariff barriers and logistics.	X				

Source: Literature and field research (2023)

Caption		
Regions	Sample	Author who lists the challenges
Brazil	Brazil	MIARELLI, 2006
Southeast	Minas Gerais	NOVAIS, 2021
North	Rondônia	ROSA NETO, 2005
Midwest	Mato Grosso	SEAF-MT/ EMPAER-MT/ EMBRAPA Rondônia, 2019 and Production System 7, 2005.
Midwest	Mato Grosso - Tangará da Serra	ENCAFÉ, 2019.

Source: Survey data (2023).

Regarding the disunity of the group of regional coffee producers, it is a limiting factor for the punctual coffee culture, since the coffee activity carried out linked to an association or cooperative establishes strength for producers in facing various production challenges, such as fostering the representativeness of the coffee culture practiced by small producers.

FINAL CONSIDERATIONS

The coffee activity is a crop that marks the economy of the municipality of Tangará da Serra - MT since its implementation by the Land Company, which provided the migration of several families to the municipality in order to produce coffee, rice, corn and beans, and coffee production is now a smaller-scale activity. With this, the research problem was to

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highlight the main challenges faced by Amazonian robusta coffee producers in Tangará da Serra - MT in 2023.

As a conclusion, it can be mentioned that the local coffee culture faces various challenges in the production of Amazonian robusta coffee, which are factors that impact the activity, with producers who act individually, limiting the representativeness of the tangaraense culture that would be made possible by coffee associations or cooperatives, a link that would mitigate the challenges faced in the activity.

For the expansion of the coffee plantation, the use of the irrigation method is fundamental, since without practice it is not possible to exploit the maximum capacity of the coffee bearing plant in its productivity. However, it is essential to adapt the use of water by producers to ensure their right to use the water resource in a managed way, thus minimizing possible conflicts between users, giving the producer the opportunity to expand the coffee culture in the region.

Succession to the coffee activity is a challenge since it is the moment of passing control of the activities to the next generation or to the next management, however it is a necessary decision for the continuity of the culture. For the transfer of power, it is necessary to plan and prepare the successor, introducing him in daily coffee activities, such as entrusting responsibilities, establishing a link with suppliers of inputs and customers of the bean, among many other factors.

Considering the objectives of the research to characterize the producers of Amazonian robusta coffee, it is proven that they are middle-aged producers, predominantly married and with an average of 2 children and with an average of high school education.

Regarding identifying the challenges of Tangara's coffee production, it is proven that the irrigation method and the lack of labor for the field are specific challenges for the activity, factors that impact the crop directly.

Regarding the difficulties of coffee production, comparing the challenges listed in 2019 with those listed in 2023, new challenges were identified in 2023, such as challenges listed in 2019 that still remain unresolved.

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