RELISE

FROM SEED TO HARVEST: THE PATH OF MODERNIZATION AND CREDIT IN THE SYSTEMIC VISION FOR SUCCESS IN THE FIELD[1]

DE SEMENTE A COLHEITA: O CAMINHO DA MODERNIZAÇÃO E DO CRÉDITO NA VISÃO SISTÊMICA PARA O SUCESSO NO CAMPO

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ABSTRACT

The agricultural sector is a broad market environment; the evolution and improvement of technologies means that producers try to keep up to date, since technology has increasingly facilitated production. The objective is to analyze the perception of small producers in relation to modern production techniques and access to financing in the agricultural sector. Small rural producers, both cattle ranchers and farmers, participated in the survey, via electronic means, with a total of 82 responses. The questionnaire was predominantly on an ordinal scale, using a 5-point agree/disagree scale, validated with Cronbach's alpha at 0.793. The main findings, considering only the answers of "strongly agree", are that 71% think it is important for rural producers to have easy access to a line of rural financing; 56% believe that rural financing helps to overcome related difficulties; 63% think that agricultural planning provides better ways of producing; 60% consider the use of agricultural planning important; 63% believe that planning each stage of production is important to be prepared to solve difficulties; 63% consider that agricultural planning is a good strategy to increase productivity; 61% believe that production planning helps to make the best decisions; 61% consider access to new modern production technologies important; and 29% believe that the changes brought about by modernization in agriculture are easily accepted by rural producers. The contribution of the study was to point out the difficulties and demands that small producers face today.

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RESUMO

O setor agrícola é um ambiente amplo no mercado; a evolução e aprimoramento das tecnologias faz com que os produtores tentem se manter atualizados, uma vez que, cada vez mais, a tecnologia tem facilitado a produção. O objetivo é analisar a percepção do pequeno produtor em relação às técnicas modernas de produção e acesso a financiamento no setor agropecuário. Pequenos produtores rurais, tanto pecuaristas quanto agricultores, participaram do levantamento, por meio eletrônico, em um total de 82 respostas. No questionário, predominou a escala ordinal, utilizando uma escala de 5 pontos do tipo concordo/discordo, validada com alpha de Cronbach em 0,793. Como principais achados, considerando somente as respostas de concordo totalmente, tem-se que 71% acham importante que o produtor rural tenha acesso facilitado a uma linha de financiamento rural; 56% acreditam que o financiamento rural ajuda na superação das dificuldades relacionadas; 63% acham que o planejamento agropecuário proporciona melhores maneiras de produzir; 60% consideram importante a utilização de um planejamento agropecuário; 63% acreditam que o planejamento de cada etapa da produção é importante para estar preparado para solucionar as dificuldade; 63% consideram que o planejamento agrícola é uma boa estratégia para aumentar a produtividade; 61% acreditam que o planejamento da produção ajuda a tomar as melhores decisões; 61% acham importante o acesso a novas tecnologias modernas de produção; e 29% acreditam que as mudanças proporcionadas pela modernização na agropecuária são aceitas com facilidade pelo produtor rural. A contribuição do estudo foi apontar as dificuldades e as demandas que o pequeno produtor possui na atualidade.

Palavras-chave: modernização, financiamento, produtor rural.

INTRODUCTION

From the 1950s onwards, agricultural activity in Brazil experienced intense modernization, associated with the industrialization and urbanization of the territory. Although the increase in the cultivation of various crops is linked to the conquest of new areas, such as the savannas, it is notable that Brazil has become, in the last twenty years, one of the main producers and exporters of agricultural products worldwide. On the other hand, many agricultural properties have not been modernized, especially in the North and Northeast regions (Bavaresco; Santos, 2024).

Modernization and efficiency in agriculture face multiple challenges, especially in a scenario where technology becomes increasingly fundamental.

In this context, systems theory emerges as a valuable approach to understanding the dilemmas faced by rural producers. This theory highlights the interconnection and interdependence of system components, emphasizing the importance of considering not only isolated parts but also their relationships and interactions (Santo Saraiva et al., 2024).

According to Favarão and Favareto (2021), systems thinking theories began developing in the mid-20th century, aiming for innovations that could complement the criticisms and limitations of modern science, frequently applied in project execution. Initially directed at small farmers in the Third World, who generally have limited productive resources, these theories seek to bring a new perspective.

General systems theory addresses essential elements to be considered, such as models, principles, and laws that apply to systems generally, regardless of their niche or the nature of the elements composing them (Capra, 1997).

This theory focuses on the search for universal principles that apply to systems as a whole, and organizations are seen as open systems that receive

inputs in the form of energy, supplies, people, etc., and provide outputs like products and services (Bertalanffy, 1975).

As sustained by Silva Neto (2005), systems thinking principles allow producers to adopt a more strategic approach to decision-making when seeking to modernize their production, considering not only the immediate impacts of a decision but also its consequences throughout the agricultural system, covering financial, social, and environmental aspects.

According to Apollin and Eberhart (1999), systems theory encourages harmonization between technologies and sustainable practices, implying not only the adoption of advanced technologies but also reflection on how to implement them sustainably, minimizing negative impacts on the environment and local communities.

Drawing on reflections by Dufumier (1996), a systemic approach recognizes the importance of relationships and partnerships between various sectors of the agricultural system, including producers, financial institutions, governments, and local communities. These partnerships are essential to facilitate access to financing, government programs, and specialized knowledge necessary to promote agricultural modernization.

In the study by Silva Neto and Basso (2005), adopting a systemic view shows that producers are better prepared to face unexpected changes and challenges throughout the entire process. This broader understanding of the agricultural system facilitates adapting their strategies and practices, fostering resilience and, consequently, success.

According to the perspectives of Zuin and Giorgi (2023), adopting the fundamentals of systems theory provides important guidance for developing strategies aimed at agricultural modernization. This approach seeks to consider the agricultural system as a whole, recognizing that the interactions among its diverse components and phases directly influence decision-making, promoting

more sustainable agriculture and contributing to the sector's advancement and efficiency, avoiding failures throughout the process.

Given this, the research problem arises: how do small producers perceive modern production techniques in the agricultural sector and seek financing as means to improve their production?

The objective of this article is to analyze the perception of small producers regarding modern production techniques and access to financing in the agricultural sector.

The justification for conducting this study lies in clarifying the operation of the systemic approach and its application within the agricultural sector, which serves as the basis for the research, making clear the position of the theory in the production process, considering how the producer views modernization and sources of financing for their agricultural activity (Gonçalves, 2021).

Although the systemic approach is not the only way to study rural environments, using its operational tools can offer valuable data for developing rural development projects, as well as enabling improvements or adaptations in ongoing initiatives, a view corroborated by Silva (2006).

This article is structured as follows: the next section reviews the available literature on the main concepts and principles related to modernization and financing of the agricultural sector; then the methodology used in the research is presented; results will be exposed and discussed subsequently; and finally, the conclusions, contributions, limitations of the study, and possible directions for future research will be offered.

THEORETICAL FRAMEWORK

Modernization in the agricultural sector

According to Miguel (2010), the systemic approach establishes the scientific basis for understanding and analyzing the functioning of the agricultural production unit, recovering and clarifying the diversity and interrelations among the elements composing an object and the environment in which it is inserted.

This approach emphasizes the importance of interaction among its constituent parts, as well as seeks to highlight the organization and purpose of these elements. It starts from the premise that any object can be analyzed and understood as a system - a set of elements in constant dynamic interaction, organized around an objective and interconnected, to a greater or lesser degree, with other systems.

The application of this theory consists of detailing all processes within organizations, evidencing small producers' perspectives on the theme and how each sector interacts to complement the activities performed (Rizello, et al., 2024).

Considering capital depreciation shows that remuneration is low. Many properties jeopardize their economic viability. Due to this situation, agricultural research needs to overcome many technological and methodological challenges. The history of cooperation between Brazil and France in this area can indicate directions for the future (Campelo; Oliveira, Bassoi, 2008).

With the growing advancement of modernization and technological knowledge in the agroindustry environment, agricultural producers face certain limitations, making planning and strategy fundamental to solving production process difficulties, which often require investment greater than producers can provide.

To finance their projects and investments, producers seek tools and advisory services to facilitate and improve their practices and activities. Additionally, investing in the best available tools is important to ensure efficient production. The pursuit of modernization in rural properties reflects producers' efforts to acquire innovations to boost productivity.

According to Pirola (2022), following the industrial model, farmers perceive the need to increase production, requiring investment in labor and machinery to meet needs and ease the production process.

For Chiavenato (2012), the evolution of technology, from the industrial revolution to the invention of the computer, has been the driving force behind efficiency and automation in organizations, enabling handling of diverse products, processes, and people simultaneously, at lower cost, with greater speed and absolute reliability.

Modernizing agriculture is not simply about implementing advanced technology but involves a strategic approach considering the importance of planning, seeking financial resources, and incorporating innovative methods to address agricultural challenges sustainably and effectively.

Financing agricultural production

When confronted with financial constraints for large investments, producers seek tools and professional advice to help obtain resources and develop solid financial strategies. Access to agricultural financing, government programs encouraging modernization, and partnerships with financial institutions are fundamental to implementing cutting-edge technologies and sustainable practices (Massuquetti; Silva, 2024).

Considering Cardoso's (2018) studies, credit is a driving element. Just as economic activity depends on financing to produce, invest, and market products, agribusiness is no different. Agricultural financing, based on official credit sources

from agricultural policy, plays a fundamental role in developing Brazilian agribusiness.

According to Borges and Parré (2021), various programs were created to support, develop, and guide the sector, offering low-cost credit lines to farmers to enable investment in machinery, cover production costs, and thus increase modern agriculture.

Furthermore, recognizing the value of investing in modern, effective tools is crucial for long-term success. Adopting cutting-edge machinery, agricultural monitoring systems, data-driven decision making, and integrating sustainable practices not only boost production but also respond to growing demand for high-quality, responsibly grown food.

According to Cardoso (2018), private financing finances production. These elements have enabled expansion by increasing the presence of private banks in rural credit, as well as using compulsory resources and financing with external funds, so the rural credit beneficiary farmer experiences slight family agriculture growth.

According to IBGE (2023), rural credit and assistance, presented with statistical data from the National Rural Credit System (SNCR) of the Ministry of Agriculture and Livestock, aim to stimulate rural investments, facilitate and adapt production funding and the commercialization of agricultural products; strengthen the rural sector, especially small and medium producers; and encourage the introduction of rational methods in the production system to increase productivity, improve rural population living standards, and adequately protect the soil. Rural credit resources are divided into controlled and uncontrolled resources.

Within this context, among the financing forms and programs that favor the agricultural system, the National Program for Strengthening Family Agriculture (Pronaf) stands out. According to Fossá, Matte, and Mattei (2022), Pronaf was created in 1994 to assist small rural producers with financial aid and

technical support, promoting sustainable development and income increase, enabling family farmers to finance input acquisition, seeds, and cover their activity costs. Since 1996, it has become a government program aimed primarily at strengthening family agriculture, essential to Brazil's rural economy.

Based on data from the Sicredi credit cooperative website, agricultural funding supports purchasing inputs, seeds, fertilizers, soil correctives, pesticides, feed, mineral concentrates, semen, vaccines, mineral salt, veterinary products in general, and others. Sicredi proposes better financing conditions and supply among its consumers and members.

According to IBGE data (2023), based on studies with the Central Bank of Brazil, in 2023, demand for financing institutions per individual was: 62,580,731,371 in credit cooperatives; 66,085,970,481 in private banks; 4,787,346,296 in development banks and funding agencies; and 219,055,291,442 in public banks. Analyzing the data shows that financing occurs more frequently in public banks, nearly 63%, and the least for this purpose is in Development Banks and Funding Agencies, with less than 2%.

RESEARCH METHODOLOGY

Regarding the nature of the variables, the study was quantitative research, which, according to Santos (2000), involves the collection and quantified analysis of data, producing automatic results. The study is descriptive in its objective, combined with interviews and data provided by the institution for analysis and complementation of collected information.

According to Manzato (2012), in descriptive studies, facts or phenomena (variables) are observed, recorded, analyzed, and correlated without manipulation, aiming to accurately discover the frequency of phenomena, their relations, connections, nature, and characteristics. Such studies seek to

understand various social, political, economic situations and human behavior aspects, requiring data to be collected and orderly recorded for proper study.

The observation unit was small rural producers, both livestock farmers and crop growers, totaling 82 responses. The survey was conducted in September 2024 via Google Forms, sent by email and WhatsApp groups.

Respondent profiles showed 56% male, 44% female; by age distribution, 34% up to 22 years old; 33% between 23 and 42 years; and 33% over 42 years, with an average age of 37 years. Regarding production type, 29% focus on crop planting; 20% on livestock farming; and 51% on both.

Of these, 33% have been producers for 9 years; 39% between 10 and 25 years; and 28% for more than 26 years. The cities of origin were mainly Mato Rico (50%), Pitanga (23%), Manoel Ribas (15%), and Roncador (7%), accounting for 95% of respondents.

An ordinal scale prevailed, using a 5-point agree/disagree scale, considering 9 variables and 3 profiles - gender, age group, and producer time- validated with a Cronbach's alpha of 0.793.

The data sources are primary data, defined by Malhotra (2019) as data generated by a researcher for the specific purpose of solving the problem at hand.

The sampling technique was non-probabilistic convenience sampling, interviewing subjects with immediate and direct access (Mahaluça, 2016).

The design was cross-sectional, defined by Malhotra (2019) as descriptive, involving collecting information from a population sample only once.

Regarding statistical techniques, data analysis consisted of univariate and bivariate analyses based on absolute and relative frequencies, segmented by gender, age group, and time as a producer. Analyses were conducted in Excel and later in Jamovi software for non-parametric tests: Mann-Whitney and Kruskal-Wallis (Siegel; Castellan, 2017).

The Mann-Whitney test compares two unpaired or independent groups, while the Kruskal-Wallis test compares more than two unpaired or independent groups. If the p-value is less than or equal to the established significance level (0.05), the null hypothesis is rejected, concluding that the difference between population medians is statistically significant.

In summary, Chart 1 outlines the research methodology format adopted for this study.

Chart 1: Summary of research metodology

Methodoligcal Parameters	Methodlogical Classification
1. Nature of variables and objective	Quantitative and conclusive descriptive study
2. Observation unit	Small rural producers
3. Scale and variables	5-point agree/disagree scale with 9 variables and 3 profiles (gender, age group, and producer time), validated with Cronbach's alpha of 0.793
4. Sampling	Non-probabilistic convenience sampling with 82 interviews
5. Data collection method and approach	Survey via Google Forms and WhatsApp groups
6. Data source and design	Primary data and cross-sectional design
7. Analysis	Descriptive statistics with univariate and bivariate analyses, using non-parametric tests: Mann-Whitney and Kruskal-Wallis

Source: elaborated by authors

RESULTS AND DISCUSSION

The analysis is based on Tables 1 to 9, segmented by gender, age group, and producer time.

Table 1 aims to show respondents' opinions on the statement: "I believe it is important that every rural producer has easy access to a rural financing line."

71% of total participants fully agree; 27% agree, and only 2% disagree. Considering the current context and difficulties in having all the necessary capital for the activity, access to financing mainly helps in cases of large-scale production, which requires greater amounts of resources that are not always available in the short term. Thus, financing becomes beneficial for rural revitalization and capital movement, according to Jorcelino, Silva César, and Conejero (2024).

Regarding the Mann-Whitney test, no statistically significant difference is observed between men and women, with a p-value of 0.710 (71.0%), indicating that both men and women share similar perceptions about the importance of facilitated access to rural financing ($p > 0.05$).

As for the Kruskal-Wallis test, considering age group, the p-value of 0.732 (73.2%) indicates no statistically significant difference among different age groups, suggesting a homogeneous view about the importance of access to rural financing lines among the age groups.

Additionally, when observing the time as a producer, the p-value of 0.111 (11.1%) also reveals no significant difference among different periods of production experience, indicating that the perception of access to rural financing is widely shared across all experience levels.

Table 1 - It is important that every rural producer has easy access to a rural financing line

	Gender		**Age range**			**Time as producer**			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	72%	70%	64%	74%	74%	56%	78%	78%	71%
Agree	28%	26%	36%	22%	22%	41%	22%	17%	27%
Indifferent	0%	0%	0%	0%	0%	0%	0%	0%	0%
Disagree	0%	4%	0%	4%	4%	4%	0%	4%	2%
Totally disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mann-Whitney Test	0,710		xxxxx			xxxxx			
Kruskal-Wallis Test	xxxxx		0,732			0,111			

Source: research (2024)

Table 2 aims to present respondents' opinions regarding the statement, "I believe that rural financing helps overcome difficulties related to production."

According to Borges and Parré (2021), support, development, and guidance programs provide more viable credit lines to farmers, aiming to facilitate investment in machinery and production costs, thereby increasing agricultural modernization.

In the survey, 56% said they totally agree; 39% agreed; 4% said they were indifferent; and 1% disagreed. Financing directly impacts the producer,

encouraging both short- and long-term planning to meet obligations. When the producer decides to acquire financing, it is important to have an assumption of how the upcoming period will unfold, considering all possible events and potential solutions.

Regarding the Mann-Whitney test, a statistically significant difference is observed concerning gender, with a p-value of 0.083 (8.3%) between men and women, indicating a distinct perception between genders about the impact of rural financing ($p < 0.05$).

Regarding the Kruskal-Wallis test, considering the age group, the p-value found is 0.808 (80.8%), indicating no statistically significant difference among the age groups analyzed, suggesting similar perceptions about financing across age groups.

For the time of experience as a producer, the p-value of 0.030 (3.0%) indicates a statistically significant difference, suggesting that experience influences perception regarding rural financing as support to overcome production difficulties ($p < 0.05$).

Table 2 - Rural financing helps overcome difficulties related to production

	Gender		**Age range**			**Time as producer**			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	67%	48%	54%	56%	59%	37%	69%	61%	56%
Agree	31%	46%	43%	33%	41%	52%	28%	39%	39%
Indifferent	3%	4%	4%	7%	0%	7%	3%	0%	4%
Disagree	0%	2%	0%	4%	0%	4%	0%	0%	1%
Totally disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mann-Whitney Test	0,083		xxxxx			xxxxx			
Kruskal-Wallis Test	Xxxxx		0,808			0,030			

Source: research (2024)

Table 3 aims to present data related to the statement, "I believe agricultural planning provides better ways to produce."

According to Faria and Oliveira (2023), planning must consider internal and external variables, as these influence the organization’s environment, goals,

and activities; uncontrollable variables such as politics, economy, and environment must also be considered.

In the survey data, 63% totally agree; 34% agree; 1% are indifferent; and 1% disagree with the statement. Based on the literature, planning encompasses not only possible difficulties but all factors that involve production, also considering the variables that affect it.

Thus, producers can identify deficient factors that require greater attention and even investment, consequently overcoming production challenges and finding better ways to produce.

Regarding the Mann-Whitney test concerning gender, no statistically significant difference was found, with a p-value of 0.121 (12.1%) between men and women, indicating similar perceptions across genders about the impact of agricultural planning ($p > 0.05$).

Regarding the Kruskal-Wallis test related to age group, the p-value is 0.678 (67.8%), indicating no statistically significant difference among age groups analyzed, suggesting similar perceptions across different age groups.

However, considering the time spent as a producer, the p-value of 0.010 (1.0%) indicates a statistically significant difference, meaning experience influences the perception of agricultural planning as a tool to improve production ($p < 0.05$), as we will analyze next.

Table 3 - Agricultural planning provides better ways to produce

	Gender		**Age range**			**Time as producer**			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	72%	57%	57%	63%	70%	41%	78%	70%	63%
Agree	28%	39%	43%	33%	26%	56%	22%	26%	34%
Indifferent	0%	2%	0%	4%	0%	4%	0%	0%	1%
Disagree	0%	2%	0%	0%	4%	0%	0%	4%	1%
Totally disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mann-Whitney Test	0,121		xxxxx			xxxxx			
Kruskal-Wallis Test	xxxxx		0,678			0,010			

Source: research (2024)

Table 4 aims to present data on the statement, "I believe the use of agricultural planning is important."

According to studies, strategic planning enables understanding internal and external processes, assessing threats and weaknesses, generating opportunities and potentials, thereby identifying the best areas for investment (Borges; Parré, 2021).

Based on the research data, 60% totally agree; 39% agree; and 1% are indifferent.

Considering there was no disagreement in the survey, it can be identified that planning is a crucial point in production, allowing producers to keep future periods in mind, be aware of needs and possible complications—in other words, producers will have greater efficiency and foresight for subsequent production.

Regarding the Mann-Whitney test, no statistically significant difference was observed between men and women, with a p-value of 0.747 (74.7%), indicating both genders share similar perceptions about the importance of agricultural planning ($p > 0.05$). No data were provided for analysis of the schooling variable.

Regarding the Kruskal-Wallis test analyzing age group, the p-value found is 0.372 (37.2%), indicating no statistically significant difference among different age groups, suggesting a homogeneous opinion across age groups on the topic.

As for the time of experience as a producer, the p-value of 0.114 (11.4%) also does not indicate a statistically significant difference ($p > 0.05$), showing that regardless of experience time, producers share a similar view of the importance of agricultural planning.

Table 4 - I believe the use of agricultural planning is important.

	Gender		Age range			Time as producer			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	58%	61%	54%	56%	70%	44%	66%	70%	60%
Agree	39%	39%	46%	41%	30%	52%	34%	30%	39%
Indifferent	3%	0%	0%	4%	0%	4%	0%	0%	1%
Disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Totally disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100 %	100%
Mann-Whitney Test	0,747		xxxxx			xxxxx			
Kruskal-Wallis Test	xxxxx		0,372			0,114			

Source: research (2024)

Table 5 aims to present data regarding the statement, "I consider that planning each stage of production is important to be prepared to solve difficulties."

The role of planning, scheduling, and production control is to ensure that production is efficient and that goods and/or services are produced properly; for this, resources need to be available in adequate quantity, at the right time, and with the appropriate quality level, all with the goal of satisfying demand at the lowest possible cost (Jorcelino; Silva César and Conejero, 2024).

In the survey data, it is identified that among respondents, 63% totally agree and 37% agree.

Preparation and forecasting of production are extremely important points for producers, as being prepared for any change is always appropriate, enabling greater efficiency in problem-solving and overcoming difficulties.

Regarding the Mann-Whitney test, a marginally significant difference is observed between men and women, with a p-value of 0.056 (5.6%), indicating a slight variation in perception between genders about the importance of detailed planning at each stage of production, although this difference is not highly significant ($p > 0.05$).

Regarding the Kruskal-Wallis test, considering the age group, the p-value found is 0.104 (10.4%), indicating no statistically significant difference among groups, suggesting a uniform perception across age groups.

On the other hand, when observing the time spent as a producer, the p-value of 0.014 (1.4%) indicates a statistically significant difference, showing that experience influences the perception of the importance of planning each stage of production to face difficulties ($p < 0.05$).

Table 5 – I consider that planning each stage of production is important to be prepared to solve difficulties

	Gender		Age range			Time as producer			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	75%	54%	50%	78%	63%	44%	81%	61%	63%
Agree	25%	46%	50%	22%	37%	56%	19%	39%	37%
Indifferent	0%	0%	0%	0%	0%	0%	0%	0%	0%
Disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Totally disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mann-Whitney Test	0,056		xxxxx			Xxxxx			
Kruskal-Wallis Test	xxxxx		0,104			0,014			

Source: research (2024)

Table 6 aims to present data related to the statement, "I consider agricultural planning a good strategy to increase productivity in production."

Furquim (2021) describes strategic planning as consisting of the company's mission and business, developing an action and goal plan aimed at ensuring quality and profit, providing a vision of the future regardless of the organization's size. Strategies are defined based on data analysis, considering internal and external factors, by defining main objectives and grouping proposed themes.

Emphasizing the survey data, it stands out that 63% totally agree; 34% agree; 1% are indifferent; and 1% disagree. Thus, these indices justify the fact that planning will always be a strategy, not only in the agricultural sector, since being prepared for each stage of production allows anticipating possible contingencies and directing resources to areas with greater needs, resulting in greater efficiency and consequently better productivity.

Regarding the Mann-Whitney test, no statistically significant difference is observed between men and women, with a p-value of 0.324 (32.4%), indicating similar perceptions between genders about the importance of agricultural planning to increase productivity ($p > 0.05$).

Regarding the Kruskal-Wallis test, the p-value for age group is 0.320 (32.0%), indicating no statistically significant difference among different age groups, suggesting a homogeneous opinion on the topic among age groups.

However, when observing the variable of time spent as a producer, the p-value of 0.025 (2.5%) reveals a statistically significant difference, suggesting that experience influences perception of agricultural planning as a strategy to increase productivity ($p < 0.05$).

Table 6 – Agricultural planning a good strategy to increase productivity in production

	Gender		**Age range**			**Time as producer**			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	56%	70%	57%	67%	67%	44%	78%	65%	63%
Agree	42%	28%	43%	26%	33%	52%	19%	35%	34%
Indifferent	3%	0%	0%	4%	0%	4%	0%	0%	1%
Disagree	0%	2%	0%	4%	0%	0%	3%	0%	1%
Totally disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mann-Whitney Test	0,324		xxxxx			xxxxx			
Kruskal-Wallis Test	xxxxx		0,320			0,025			

Source: research (2024)

Table 7 aims to present opinions on the statement, "I believe that production planning helps make better decisions in production."

Strategic planning corresponds to various measures that managers and business responsible individuals can take to anticipate future situations influenced by internal and external factors that may affect the organization. Planning can assist in decision-making to minimize risks and maximize opportunities, should be continuous, and always aim for the objectives the organization seeks to achieve (Borges; Parré, 2021).

In Table 7, it is identified that 61% of respondents totally agreed, 38% agreed, and 1% totally disagreed. Based on the literature, planning is described as crucial not only for overcoming difficulties but also for decision-making aimed at better production, more appropriate techniques for a given area and available resources, and to make projections about what may occur in the following period, thus facilitating decision-making and strategy development.

Regarding the Mann-Whitney test, no statistically significant difference is observed between men and women, with a p-value of 0.205 (20.5%), indicating both genders share similar perceptions about the role of planning in decision-making ($p > 0.05$).

Regarding the Kruskal-Wallis test, considering age group, the p-value is 0.767 (76.7%), indicating no statistically significant difference among age groups, showing a uniform view about the importance of production planning across different age groups. However, when observing time spent as a producer, the p-value of 0.034 (3.4%) points to a statistically significant difference, suggesting experience influences perception of planning as an essential tool for decision-making ($p < 0.05$).

Table 7 – Production planning helps make better decisions in production

	Gender		**Age range**			**Time as producer**			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	67%	57%	50%	67%	67%	37%	78%	65%	61%
Agree	33%	41%	50%	33%	30%	63%	22%	30%	38%
Indifferent	0%	0%	0%	0%	0%	0%	0%	0%	0%
Disagree	0%	0%	0%	0%	0%	0%	0%	0%	0%
Totally disagree	0%	2%	0%	0%	4%	0%	0%	4%	1%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mann-Whitney Test	0,205		xxxxx			xxxxx			
Kruskal-Wallis Test	xxxxx		0,767			0,034			

Source: research (2024)

Table 8 aims to present opinions on the statement, "I consider access to new modern production technologies important."

According to Alves (2023), technology is essential for increasing production with the goal of raising productivity. Technological advancement is responsible for increasing Brazilian commodity production (soy, coffee, orange, etc.) and for enabling efficient use of land and natural resources, as well as significantly increasing crop profitability.

In the survey data, 61% of respondents totally agreed; 35% agreed; 1% were indifferent; 2% disagreed; and 1% totally disagreed. Based on the literature, technological advances are considered highly valuable, easing manual labor and enhancing production effectiveness by introducing new handling and control practices.

Regarding the Mann-Whitney test, no statistically significant difference was observed between men and women, with a p-value of 0.267 (26.7%), indicating that both genders share similar perceptions regarding the importance of access to new production technologies ($p > 0.05$).

For the Kruskal-Wallis test, considering age groups, the p-value found was 0.918 (91.8%), indicating no statistically significant difference among age groups, suggesting a uniform view about the importance of access to modern technologies across different age groups.

However, when observing the time spent as a producer, the p-value of 0.009 (0.9%) reveals a statistically significant difference, suggesting that experience influences perception of the value of new production technologies ($p < 0.05$).

Table 8 - I consider access to new modern production technologies important

	Gender		Age range			Time as producer			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	67%	57%	61%	63%	59%	44%	81%	52%	61%
Agree	33%	37%	39%	33%	33%	56%	19%	35%	35%
Indifferent	0%	2%	0%	4%	0%	0%	0%	4%	1%
Disagree	0%	4%	0%	0%	7%	0%	0%	9%	2%
Totally disagree	0%	2%	0%	0%	4%	0%	0%	4%	1%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mann-Whitney Test	0,267		xxxxx			xxxxx			
Kruskal-Wallis Test	xxxxx		0,918			0,009			

Source: research (2024)

Table 9 aims to present opinions on the statement, "I believe that the changes brought about by modernization in agriculture are easily accepted by rural producers."

Agriculture is a high-risk activity, leading its managers and potential producers to adopt a more conservative behavior, needing to build financial reserves in good years to have working capital in possible tight situations (Jorcelino; Silva César; Conejero, 2024).

According to the same authors, rural labor in Brazil is among the least prepared for the tasks performed, considering that technologies are rapidly growing, especially in the agricultural sector, but not accompanied by sufficient training. Additionally, the average education level of the rural population is very low, which hinders learning and the adoption of these machinery improvements.

The survey shows that 29% totally agreed; 35% agreed; 15% were indifferent; 17% disagreed; and 4% totally disagreed. This was the index with the highest level of disagreement in the survey. This is due to the fact that most respondents show conservative views regarding production. Although it is a growing sector, it still presents little credibility or even limited information available to small producers.

Regarding the Mann-Whitney test, a statistically significant difference is observed between men and women, with a p-value of 0.025 (2.5%), indicating

that perceptions about the acceptance of modernization changes differ between genders ($p < 0.05$).

Regarding the Kruskal-Wallis test considering age groups, the p-value of 0.524 (52.4%) indicates no statistically significant difference among age groups, suggesting a homogeneous perception regarding acceptance of changes related to modernization across age groups.

On the other hand, when observing the time spent as a producer, the p-value of 0.021 (2.1%) reveals a statistically significant difference, suggesting that experience time influences perception about the ease of acceptance of modernization changes in agriculture ($p < 0.05$).

Table 9 - Modernization in agriculture is easily accepted by rural producers

	Gender		**Age range**			**Time as producer**			
	Female	**Male**	**Up to 22**	**23/42**	**42+**	**Up to 9**	**10/25**	**26+**	**Total**
Totally agree	44%	17%	29%	26%	33%	11%	44%	30%	29%
Agree	28%	41%	46%	37%	22%	48%	38%	17%	35%
Indifferent	11%	17%	18%	19%	7%	26%	9%	9%	15%
Disagree	17%	17%	4%	19%	30%	15%	6%	35%	17%
Totally disagree	0%	7%	4%	0%	7%	0%	3%	9%	4%
Overall Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Mann-Whitney Test	0,025		xxxxx			xxxxx			
Kruskal-Wallis Test	xxxxx		0,524			0,021			

Fonte: pesquisa (2024)

Table 10 presents a summary of the non-parametric tests: Mann-Whitney and Kruskal-Wallis, which indicate which variables have statistical significance for independent samples.

Table 10 – Summary of the non-parametric statistical tests: Mann-Whitney and Kruskal-Wallis

	Mann-Whitney Test		Kruskal-Wallis Test
	Gender P-value	**Age range P-value**	**Time as producer P-value**
Table 1 (Var 1)	0,710	0,732	0,111
Table 2 (Var 2)	0,083	0,808	0,030*
Table 3 (Var 3)	0,121	0,678	0,010*
Table 4 (Var 4)	0,747	0,372	0,114
Table 5 (Var 5)	0,324	0,320	0,025*
Table 6 (Var 6)	0,056	0,104	0,014*
Table 7 (Var 7)	0,205	0,767	0,034
Table 8 (Var 8)	0,267	0,918	0,009*
Table 9 (Var 9)	0,025*	0,524	0,021*

Source: authors (2024) – singnificant p-value at 5% (p<0,05) *

CONCLUSION

This study presented a comprehensive analysis of small rural producers' perceptions regarding fundamental topics such as financing, agricultural planning, and the adoption of new technologies. The study's objective—to analyze small producers' perceptions related to modern production techniques and access to financing in the agricultural sector—was achieved.

Overall, the results showed strong agreement among respondents on the importance of these practices for strengthening and modernizing the agricultural sector. The results also revealed that experience in the sector directly influences producers' perceptions, while factors such as gender and age group were mostly insignificant.

However, modernization faces resistance, particularly among small producers, due to lack of information and fear regarding the use of more advanced technologies.

Key findings with majority agreement include:

- 71% consider it important that rural producers have facilitated access to rural financing lines. Statistical tests showed no significant differences among groups by gender, age, or time as a producer (Table 1).

- 56% believe rural financing helps overcome difficulties related to production. Statistical tests showed no significant difference by gender or age, but time as a producer showed a significant difference (Table 2).

- 63% believe agricultural planning provides better ways to produce. Statistical tests showed no significant difference by gender or age; however, time as a producer showed significance (Table 3).

- 60% consider the use of agricultural planning important. No significant differences were found by gender, age, or producer time (Table 4).

- 63% consider planning each production stage important to be prepared to solve difficulties. No significant differences by gender or age; significant difference by producer time (Table 5).

- 63% see agricultural planning as a good strategy to increase production productivity. No significant gender or age differences; producer time was significant (Table 6).

- 61% believe production planning helps make better production decisions. No significant differences by gender, age, or producer time (Table 7).

- 61% consider access to new modern production technologies important. No significant gender or age differences; producer time was significant (Table 8).

- Only 29% believe that changes brought by modernization in agriculture are easily accepted by rural producers. No significant differences by age; however, gender and producer time differences were significant (Table 9).

As a contribution, the study highlighted planning as an essential strategic tool both to overcome challenges and increase productivity. Access to financing and modern technologies was widely recognized as crucial to ensuring sustainability and competitiveness in rural production.

The study also identified significant challenges, especially related to workforce training and educational levels, which limit the full integration of

technological innovations into producers' daily routines. Furthermore, it reinforces the importance of integrated strategies considering small producers' specificities and needs, prioritizing information dissemination and innovation incentives in the sector.

A significant limitation was the relatively low number of participants, although data collection occurred in three main cities. This restriction reflects the need to expand scope and coverage in future studies, involving more locations and respondents for a more representative analysis.

REFERENCES

ALVES, Eliseu. Embrapa: um caso bem-sucedido de inovação institucional. **Revista de política agrícola**, v. 19, n. 5, p. 65, 2023.

APOLLIN, F.; EBERHART, C. **Análisis y diagnóstico de los sistemas de producción en el medio rural**: guía metodológica. Quito (Ecuador): CAMAREN (Sistema de Capacitación para el manejo de los recursos naturales renovables), 1999.

BAVARESCO, A. H.; DOS SANTOS, R. A. Modernização e conformação das redes na suinocultura do oeste catarinense. **Revista Pantaneira**, v. 23, p. 114-130, 2024.

BERTALANFFY, L. **Teoria geral dos sistemas**. Petrópolis: Vozes, 1975.

BORGES, M. J.; PARRÉ, J. L. O impacto do crédito rural no produto agropecuário brasileiro. **Revista de Economia e Sociologia Rural**, v. 60, n. 3, 2021.

CAMPELO, P. L.; OLIVEIRA, R. A.; BASSOI, L. H. Zoneamento agroclimático do Estado de Goiás. **Revista Brasileira de Agricultura Irrigada**, v. 22, n. 1, p. 37-44, 2008.

CAPRA, F. **A teia da via**: uma nova compreensão científica dos sistemas vivos. São Paulo, Caetés, 1997.

CARDOSO, A. **Política agrícola e fontes de recurso para o crédito rural**: um

estudo sobre a dinâmica do financiamento de grãos. In: Anais Congresso Sul Catarinense de Administração e Comércio Exterior. 2018.

CHIAVENATO, I. **Princípios da Administração**: o essencial em Teoria Geral da Administração. [s.l.] Editora Manole, 2012.

DUFUMIER, M. Les projets de développment agricole: manuel d'expertise. Paris: **CTAKarthala**, 1996.

FARIA, D. C., OLIVEIRA, R. D. C. A. Planejamento Empreendedor no Agronegócio: Entrepreneurial Planning in Agribusiness. **Brazilian Journal of Business**, *5*(2), 847-857, 2023.

FAVARÃO, C. B.; FAVARETO, A. Abordagem sistêmica, coalizões e territórios: contribuições teóricas para a análise das transições sustentáveis em sistemas agroalimentares. **Raízes: Revista de Ciências Sociais e Econômicas**, v. 41, n. 2, p. 164-185, 2021.

FOSSÁ, J. L.; MATTE, A.; MATTEI, L. F. A trajetória do Pronaf: análise das operações de crédito nos municípios brasileiros entre 2013 e 2020. **Extensão Rural**, v. 29, n. 1, p. e1-e1, 2022.

FURQUIM, M. G. D. et al. Proposição de um modelo de estratégia de marketing em loja agropecuária. **Revista Brasileira de Administração Científica**, v. 12, n. 1, p. 40-51, 2021.

GONÇALVES, J. R. **Manual de projeto de pesquisa**. Portal de Livros Abertos da Editora UniProcessus, *13*(13), 01-82, 2021.

IBGE – INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (org.). **Anuário estatístico do Brasil**. Disponível em: https://anuario.ibge.gov.br/2023/agropecuaria-e-extracao-vegetal/credito-e-assistencia-rural/aeb-2023-tabelas-credito-e-assistencia-rural/22156-financiamen. Acesso em: 24 jan. 2025.

JORCELINO, Tallyrand Moreira; SILVA CÉSAR, Aldara; CONEJERO, Marco Antonio. As fontes de financiamento no agronegócio e a influência das parcerias institucionais para acesso ao crédito rural. **Encontro Internacional de Gestão, Desenvolvimento e Inovação** (EIGEDIN), v. 7, n. 1, 2024.

MAHALUÇA, F. Noções de amostragem. **Estatística Aplicada**, 2016.

MALHOTRA, Naresh K. **Pesquisa de marketing: uma orientação aplicada**. Sao Paulo SP: Grupo A, 2019.

MANZATO, A. J.; SANTOS, A. B. **A Elaboração de questionários na pesquisa quantitativa**, 2012.

MASSUQUETTI, Angelica; SILVA, Leonardo Xavier da. Política agrícola brasileira do fim do século XX ao início dos anos 2020. **Estado, políticas públicas e desenvolvimento rural no Brasil**. Porto Alegre: Editora da UFRGS, 2024. [recurso eletrônico]. p.[159]-191 (Cap. 6), 2024.

MIGUEL, L. de A. **Abordagem sistêmica da unidade de produção agrícola**. Gestão e planejamento de unidades de produção agrícola. Porto Alegre: Ed. da UFRGS, 2010.

RIZELLO, Lucas Émerson et al. Tecnologia da agricultura de precisão: aplicações e benefícios do uso de máquinas agrícolas. **Revista Novos Desafios**, v. 4, n. 2, p. 216-222, 2024.

SANTOS SARAIVA, J. et al. Índice de modernização da agricultura: dinâmicas e determinantes na agricultura paraense**. Revista Científica da Faculdade de Educação e Meio Ambiente**, v. 15, n. 1, p. 168-186, 2024.

SANTOS, A. R. **Metodologia científica**: a construção do conhecimento. 3. ed. Rio de Janeiro: DP&A editora, 2000.

SIEGEL, S.; CASTELLAN, J. N. Jr. **Estatística Não Paramétrica para as Ciências do Comportamento**. Artmed-Bookman. São Paulo, 2017.

SILVA NETO, B. Abordagem sistêmica, complexidade e sistemas agrários. In Da MOTA; D.M.; SCHMITZ, H.; VASCONCELLOS, H.E.M. Agricultura familiar e abordagem sistêmica. Aracaju: **Sociedade Brasileira de Sistemas de Produção**, 2005.

SILVA NETO, B.; BASSO, D. **Aplicação da teoria dos sistemas agrários para a análise da agricultura do Rio Grande do Sul**. In Sistemas agrários do Rio Grande do Sul: análise e recomendações de Políticas. Ijui: UNIJUI, 2005.

ZUIN, A. L. A.; DE GIORGI, R. O direito ao alimento na perspectiva da Teoria Sistêmica e por uma ecologia dos direitos humanos. **Cadernos de Dereito Actual**, n. 21, p. 287-302, 2023.