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ARTICLE

Effects of technical assistance and rural extension actions on the quality of life of rural producers

Efeitos das ações de assistência técnica e extensão rural na qualidade de vida dos produtores rurais

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Resumo: Esta pesquisa teve por objetivo mensurar o efeito das ações de assistência técnica e extensão rural (ATER) nos meios de vida e na qualidade de vida de agricultores familiares atendidos pela Emater no estado de Goiás, Brasil. A amostra é formada por 120 agricultores atendidos pela Emater no período de 2018 a 2022. Os dados foram coletados por meio de questionário estruturado e analisados por modelagem de equações estruturais PLS-SEM. As ações de ATER têm efeito direto positivo nos meios de vida e na qualidade de vida. Além disso, os meios de vida mediam parcialmente a relação entre ATER e qualidade de vida. Em relação aos efeitos indiretos específicos, a renda foi a dimensão da qualidade de vida mais afetada tanto pela ATER quanto pelos meios de vida, enquanto o capital financeiro foi a dimensão dos meios de vida mais influenciada pela ATER. Esses resultados destacam a contribuição significativa da ATER para aspectos econômicos e financeiros da vida dos agricultores familiares, ao mesmo tempo em que confirmam a importância da educação e da habitação (dimensões da qualidade de vida) e do capital natural, humano e social (dimensões dos meios de vida) para o desenvolvimento global da vida desses agricultores. Os resultados contribuem para a literatura de ATER, meios de subsistência e qualidade de vida, e a validação do instrumento de mensuração da ATER fornece subsídios valiosos para futuros estudos e importantes direcionamentos para a Emater rever e fortalecer suas políticas de ATER.

Palavras-chave: Emater, meios de vida, agricultura familiar, PLS-SEM.

Abstract: This research aimed to measure the impact of technical assistance and rural extension (ATER) actions on livelihoods and quality of life of family farmers assisted by Emater in the state of Goiás, Brazil. The sample is of 120 farmers assisted by Emater from the 2018 to 2022, and data were collected through a structured questionnaire and analyzed using PLS-SEM. ATER actions has a positive direct effect on both livelihoods and quality of life. Moreover, livelihoods partially mediate the relationship between ATER and quality of life. Regarding specific indirect effects, income was the dimension of quality of life most affected by both ATER and livelihoods, while financial capital was the dimension of livelihoods most influenced by ATER. These findings highlight the significant contribution of ATER to the economic and financial aspects of family farmers, while acknowledging the importance of education and housing (dimensions of quality of life) and natural, human, and social capital (dimensions of livelihoods) for their overall development. The results contribute to the literature on ATER, livelihoods and quality of life, and the validation of the ATER measurement instrument provide valuable subsidies for future studies and important directions for Emater in order to review and strengthen the ATER policies.

Keywords: Emater, livelihood, family agriculture, PLS-SEM.

Introduction

Recent statistics on family farming confirm its importance for the performance of the agriculture in Brazil. Data from the 2017-2018 Agricultural Census, published by the Brazilian Institute of Geography and Statistics (IBGE), reveal that 76.8% out of 5.073 million rural establishments in Brazil, belong to family farming (Rosa Neto, Silva, & Araújo, 2020). They are responsible for 65 main agricultural products of the "Brazilian Basic-needs grocery package" produced in the country. Excluding the industrial crops of soy, corn, wheat and sugar cane, the participation of family farming reaches about 30% of the total produced, in tons (Rosa Neto et al., 2020).

Family farming has an even more significant importance when the discussion turns to vegetables and fruits. For example, family farming is responsible for 81.2% of strawberry production and 79.3% of grape production for wine and juice (Rosa Neto, et al., 2020). It is also worth noting that 31% of the number of cattle heads, 45.5% of poultry, 51.4% of pigs, and 70.2% of goats belong to family farming; in addition to 64.2% of the country's milk production (Rosa Neto et al., 2020).

Despite its significant economic and social potential, family farming faces its own difficulties, characteristic of an activity carried out by less skilled producers operating in a highly competitive and technified environment (Batalha et al., 2005). Capital constraints and limited market access hinder the development of family farming, acting as barriers that prevent family farmers from capitalizing on the advantages of their location in the markets and leveraging the institutional environment in which they operate (Abramovay, 1998).

To reduce these barriers and minimize inequalities in rural areas, the country has implemented public policies that prioritize family farming, such as rural technical assistance and extension services (ATER), institutionalized in the 1950s (Peixoto, 2008), aiming to improve the income and quality of life of rural families through the improvement of production systems, access to resources, and other services. The National Program for Family Agriculture (Pronaf)[1], created in 1996, provides family farmers with access to credit and technical assistance (Dias, 2007).

Although Pronaf is of utmost importance for family farming, its impacts on income, livelihoods, productivity, and employment generated in rural areas are not consistently presented in the literature, as indications suggest that, overall, Pronaf has only partially achieved the expected results (Damasceno et al., 2011). On the other hand, ATER has shown satisfactory performance (Silva, 2014), particularly in terms of employing appropriate techniques that ensure a higher adoption of technology and improve quality of life (Ferreira & Khan, 2010) while enhancing competitiveness for family farmers (Batalha et al., 2005).

This study examines the ATER actions promoted by Enterprise for Technical Assistance, Rural Extension and Agricultural Research (Emater) and their effects on the quality of life of rural producers in the state of Goiás, Brazil. Quality of life is identified as the satisfaction of a range of basic human needs that ensures a certain level of life for a population (Nahas, 2001), and measured by a quality-of-life index (QLI) that captures aspects related to education, health, housing, income, food, leisure, information, and communication (Sousa et al., 2004; Maia & Sousa, 2008).

Additionally, based on the results of Cavalcante et al. (2022) about the contributions of livelihoods to the inclusion of family farmers in markets, this study seeks to identify whether livelihoods mediate the effects of ATER on the quality of life of producers assisted by Emater in the state of Goiás. Livelihoods are understood from the theoretical perspective of the Livelihoods Approach (Van der Ploeg et al., 2000; Carney, 2003; Ellis & Freeman, 2004; Scoones, 2009) as the set of resources (natural, financial, human, and social capital) whose availability, access, and use determine the survival strategies and integration of small farmers into markets (Cavalcante et al., 2022).

In this context, this study aims to answer the following question: Have the technical assistance and rural extension (ATER) actions developed by Emater positively affected livelihoods and quality of life of rural producers benefiting from this public policy in the state of Goiás, Brazil? In order to address this question, the objective is to measure the effect of ATER actions on the livelihoods and quality of life of rural producers assisted by Emater.

[1] Pronaf is a rural credit policy aimed at family farming and closely related to technical assistance, as the program included technical assistance payment in rural credit projects (Dias, 2007).

2. Theoretical Background

2.1 Technical assistance and rural extension – ATER

Technical assistance is among the various government actions aimed at supporting and promoting rural development, with the objective of disseminating technologies, along with agricultural research and formal technical and higher education (Brasil, 2013). Starting in the 1960s, technical assistance to farmers was structured and gained strength in Brazil, contributing to the modernization of agriculture in the 1970s and giving rise to the rural extension professional responsible for the dissemination of technological innovations to large and small rural producers (Brasil, 2013).

With the creation of the brazilian company for technical assistance and rural extension (Embrater) in the mid-1970s, a new ATER initiative emerged to promote the training of extension workers and to structure appropriate and organized ways of transferring knowledge to the rural sector. In the 2000s, the launch of the National Policy for Technical Assistance and Rural Extension (Pnater), targeting family farmers (Brasil, 2013), introduced a new conception of ATER services in Brazil. ATER ceased to be based solely on technology transfer and shifted to a focus on rural development, including actions such as organizing farmers, managing participatory processes, supporting commercialization, and inter-institutional coordination with a focus on territory and environmental issues (Landini, 2015).

The Pnater was formulated as an exclusive policy for family farming and regarded ATER services as a right, similar to other public services. Therefore, the over 5 million Brazilian family farming establishments gained the right to qualified and sufficient technical assistance, and rural extension services to meet their production, commercialization, and social organization demands (Silva, 2014). In this context, ATER assumes an expanded mission, going beyond simply providing technical assistance to increase production, and becoming an "agency for development capable of contributing to mobilizing the set of energies capable of making rural areas conducive to the fight against social exclusion" (Abramovay, 1998, p. 140), with the major objectives being sustainable development and improved living conditions (Abramovay, 1998).

In the state of Goiás, Emater in addition to train and qualify the farmers in technical (production, management, etc.) and managerial matters, the institution also provides guidance and encourage their participation in rural social organizations such as associations and cooperatives. Additionally, Emater assists farmers in the development of economically viable projects and other aspects aimed at facilitating access to rural credit from financial institutions.

The training and qualification of farmers aim to foster integrated actions for professional development, contributing to the social, economic, environmental, and cultural development of rural families (Mezomo, 2010). Through training and qualification actions, Emater equips rural producers with the knowledge of technological and managerial practices, enabling them to manage their properties and market their products effectively, thus ensuring their continued engagement in agricultural activities (Mezomo, 2010).

The guidance on cooperatives and associations supports and promotes rural social organizations (associations and cooperatives) among farmers and their families, with the objective of encouraging collective efforts that strengthen political representation, increase economic gains, improve the production process, and integrate them with their respective communities. These actions have been the subject of study by government agencies linked to the agricultural sector, such as Emater and the Ministries of Agrarian Development (MDA) and Agriculture, Livestock, and Supply (MAPA) (Souza et al., 2020).

The assistance provided to farmers in accessing rural credit helps them obtain financial resources allocated by Brazilian agricultural policies for the financing of production activities, the acquisition of machinery and equipment, and the maintenance and commercialization of agricultural products (Resende & Mafra, 2016). Through rural credit, farmers finance assets and services necessary for their enterprises, including technological innovation, environmental conservation practices, housing renovation and construction, working capital (seeds, pesticides, corrective measures, etc.), and management tools (hardware and software), among others (Resende & Mafra, 2016). The advisory support also guides farmers in the rational allocation of financial resources throughout the project duration (Empresa Brasileira de Pesquisa Agropecuária, 2023).

2.2 The livelihoods of family farmers

The Livelihoods Approach theoretical framework (Scoones, 2009; Carney, 2003) advocates for the reconfiguration of availability, access, and use of resources (land, capital, labor, knowledge, technologies, power) as key elements in the survival strategies and market integration of small-scale farmers (Van der Ploeg et al., 2000). Researchers and development agencies employ this theoretical approach to understand how farmers navigate constraints in economic, social, and environmental spheres (Cavalcante et al., 2022). In agriculture, resources correspond to different types of capital (natural, financial, human, social, etc.) that vary depending on the specific context under analysis (Cavalcante et al., 2022).

Natural capital represents natural resources such as soil fertility, water availability, hydrological cycles, and more (Batalha et al., 2005), encompassing land, water, forests, biodiversity, and mineral resources (Guerry et al., 2015). Land provides the physical space for crop cultivation, animal husbandry, and other agricultural activities. Access to quality water (in sufficient quantity) is also crucial for agricultural development. Biodiversity and ecosystems play a crucial role in maintaining soil health, pollinating crops, and regulating pests and diseases (Felicity et al., 2022).

Financial capital represents resources (money, credit) essential for acquiring inputs, machinery and equipment, infrastructure, and new technologies aimed at diversifying and increasing the efficiency of productive activities (Gasques et al., 2004). It also plays a significant role in risk management, allowing farmers to protect themselves against losses caused by adverse climatic events, price fluctuations, and other uncertainties inherent in agricultural activities (Barry, 1995).

Human capital refers to the knowledge, skills, abilities, and experiences of farmers that enable them to adopt more efficient production techniques (Fukuyama, 1996). Developing human capital is crucial for the adoption of sustainable agricultural practices, efficient management of natural resources, and the pursuit of innovations that enhance productivity and profitability in farming. Access to formal and informal education, technical training, specific capacity-building programs, and exchanges of experiences among farmers play a crucial role in strengthening human capital. Farmers with a high level of human capital are better equipped to face challenges, adapt to changes, and seize opportunities to improve their livelihoods (Fukuyama, 1996).

Social capital facilitates collective action, reducing scale problems and transaction costs (Wiggins & Keats, 2019), and is shaped by trust, information flows, norms, and sanctions (Ostrom, 2000). Generally, the emergence of social capital relies on engaged leadership, and its functioning depends on interaction with other forms of capital (Crona et al., 2017). It is a resource that is structured and grounded in the relationships between social actors, establishing obligations and mutual expectations, fostering reliability in social relations, and facilitating the flow of internal and external information.

2.3 Quality of Life in Rural Areas

As the quality of life has become a major concern in recent decades, since 1960, the United Nations (UN) has used the Human Development Index (HDI) to assess living conditions in its member countries. The HDI is a ranking that assigns scores from zero to 1 based on the level of development in three areas: education, income, and life expectancy. The HDI allows us to examine whether people are capable of enjoying the more subjective and immeasurable benefits of development, such as access to information, education, and political participation (Sousa et al., 2004).

Nahas (2001) synthesize the concept of quality of life by stating that it can be identified as the satisfaction of a spectrum of basic human needs that ensures a certain level of living for a population. In rural areas, assessments of quality of life rely on indicators in key areas such as education, health, housing, sanitation, leisure, and ownership of durable goods (Sousa et al., 2004), as they provide a comprehensive view of well-being and living conditions and enable a more precise analysis of quality of life in rural areas (Sousa et al., 2004). According to Maia & Sousa (2008), indicators in these areas can be supplemented with others aimed at capturing aspects such as food, information, and communication, which would allow for a more comprehensive evaluation of quality of life (Maia & Sousa, 2008).

2.4 Research Hypothesis and Conceptual Model

The context of the new configuration of productive activities, observed since the late 20th century, in which family farmers began to diversify their work within the family unit, interrupting the exclusive dedication previously given to agricultural activities (Nascimento et al., 2018), makes ATER a strategic instrument for rural development. With the emergence of new agricultural and non-agricultural activities, family farmers need to master the production process (Nascimento et al., 2018).

Based on the new paradigm of Pnater as a public policy for rural areas in Brazil (Queiroz & Costa, 2015), ATER has been modified to transform the extension worker into a mediator of knowledge, acting as an agent of rural community development (Caporal & Ramos, 2006), especially for small-scale farmers. ATER has enabled these farmers to gain greater access to individual and collective productive resources (natural and financial capital) and social resources (human and social capital), with implications for increased income and improved living conditions (Queiroz & Costa, 2015).

Kasmin et al. (2019) corroborate these arguments by demonstrating that the ATER provided by Emater was decisive in defining and instructing producers on the product standards required by the agribusiness sector to meet the demands of the School Feeding Programs (PNAE) and Food Acquisition Programs (PAA). Furthermore, according to the authors, without the direct involvement of Emater technicians, neither the cooperative nor the assisted farmers would have been able to meet the required production standards. ATER also contributed to the rapid and correct establishment and implementation of the agribusiness activities (Kasmin et al., 2019).

Similarly, Ferreira & Khan (2010) found that farmers assisted by the Rural Agent program of Emater present a higher general technological index (GTI) compared to non-assisted farmers. The low technological index of non-assisted producers underscores the importance of the program, as the services provided by the agents lead the assisted farmers to adopt practices that contribute to higher productivity (Ferreira & Khan, 2010).

Ferreira & Khan (2010) also observed that the quality-of-life index (QLI) of assisted farmers was higher than that of non-assisted farmers through the Rural Agent program, as the proportion of assisted farmers with a high level of quality of life was greater than that of non-assisted farmers. In terms of employment generated per hectare, assisted farmers had a higher average compared to non-assisted farmers, as did income, with the average income per hectare of assisted farmers being higher than that of non-assisted farmers.

Based on the aforementioned results, the hypotheses of this research postulate that ATER actions have positive effects on the quality of life (education, housing, and income) of the assisted farmers and their families, as well as on their livelihoods, which include the resources (natural capital, financial capital, human capital, and social capital) that enable the management, production, and marketing of agricultural products.

In this perspective, it is plausible to infer that livelihoods also have a positive impact on quality of life, as they contribute to improving housing conditions, education levels, and the income of farmers. In this case, there would be a mediating effect of livelihoods on the relationship between ATER and quality of life. With these considerations in mind, the following hypotheses are presented:

H1: Technical assistance and rural extension (ATER) actions positively affect the quality of life of assisted farmers.

H2: Technical assistance and rural extension (ATER) actions positively affect the livelihoods of assisted farmers.

H3: Livelihoods positively affect the quality of life of assisted farmers.

Figure 1 presents the conceptual model with the indicated hypotheses described above.

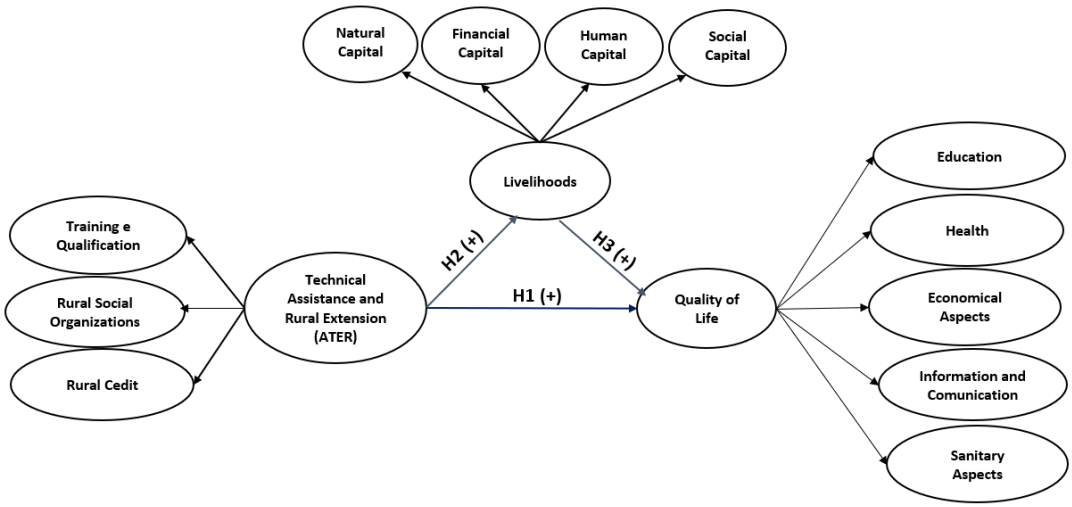

Figure 1. Research conceptual model.
Source: Authors

3 Methodology

This research is exploratory and descriptive, based on data collection through a structured questionnaire and quantitative data analysis using structural equation modeling (PLS-SEM). The population consists of 516 farmers in the state of Goiás, Brazil, who have been assisted by Emater with at least one ATER action (training and qualification, guidance on joining rural social organizations, and support in obtaining rural credit) between 2018 and 2022. The list of assisted farmers was provided by Emater.

Sample size calculation was performed using G*Power software, based on a model testing the effect of two independent variables (ATER and Livelihoods) on a dependent variable (quality of life), with the following parameters: 95% of sampling power, 5% measurement error, medium effect size ($f^2 = 0.15$), F-test, and fixed regression model for R^2 different from zero.

Data collection resulted in 120 responses from farmers located in 38 municipalities in the state of Goiás, surpassing the minimum quantity of 107 respondents indicated by G*Power software, an appropriate tool for sample size calculation in studies applying Partial Least Squares Structural Equation Modeling (PLS-SEM) (Hair et al., 2019). The sample is a non-probabilistic (judgment) sample because, in addition to the requirement of having benefited from at least one of the mentioned ATER actions, the choice of the municipality where the farmer is located was based on the highest frequency of activities conducted by Emater extension workers. Data collection was conducted in person from November 1, 2022, to January 30, 2023.

The data collection instrument is a structured questionnaire consisting of four parts: 1) eleven questions aimed at characterizing the respondents, 2) a scale for measuring ATER, 3) a scale for measuring livelihoods, and 4) a scale for measuring quality of life. Considering that the ATER measurement scale is an original construction of this study, it underwent a qualitative validation process (content and face validation), following the protocol described by Costa (2011). Five experts (four Ph.D. linked to the graduate programs in agribusiness and one Ph.D. linked to the Emater) contributed to this process, which occurred in two stages.

The first stage - content validation - refers to the extent to which the items in a scale provide the desired information in all dimensions of the construct being measured. It is a primary evaluation of the adequacy of the items to the conceptual domains of the construct (Costa, 2011). In this stage, the experts assessed whether the conceptual attributes of the construct were adequately represented by the items (Costa, 2011). The second stage - face validity - refers to the degree to which the data collection instrument appears to measure what it was designed to measure. The three experts verified whether the items were appropriate for the construct and the measurement purpose (Costa, 2011).

The measurement scale for the Livelihoods construct was tested and validated by Cavalcante et al. (2022), while the measurement scale for the quality-of-life concept was constructed based on indicators present in previous studies (Sousa et al., 2004; Maia & Sousa, 2008). For these reasons, there was no need to submit these scales to the qualitative validation process. In all three measurement instruments, responses were collected using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), with a neutral midpoint (3 - neither agree nor disagree).

The data from Part 1 of the questionnaire were analyzed using frequency counts in Excel®. The data from Parts 2, 3, and 4 were analyzed using PLS-SEM, with the SmartPLS 4.0 software. PLS-SEM is a set of multivariate statistical analysis techniques that enhances the ability to understand and confirm results from more complex research studies (Hair et al., 2019), making it suitable for analyzing data that do not have multivariate normal distribution and for analyzing models with multiple constructs and a large number of observed variables (Ringle et al., 2014)

4 Results and Discussion

4.1 Characterization of the sample of responding farmers

The 120 surveyed farmers are located in 38 municipalities in the state of Goiás, Brazil. The majority of them (60.83%) are between 51 and 75 years old, have a primary education level (62.50%), and have a family income ranging from 3 to 7 minimum wages (76.66%).

Approximately 42% of them accessed Pronaf (National Program for Strengthening Family Agriculture) at least 3 times between 2018 and 2022, while 22.50% never had access to this public policy. The majority of them received training and qualification at least once during the same period (64.17%), guidance on cooperativism and association (70.83%), and support in obtaining rural credit (75%), which demonstrates high accessibility of the respondents to the ATER actions promoted by Emater. More detailed information about these aspects is presented in Table 1.

Table 1. Distribution of socioeconomic profile of respondents

Parameter	Class	Frequency (%)
Age	Until 25 years	0.00%
	From 26 to 50 years	38.33%
	From 51 to 75 years	60.83%
	Over 75 years	0.83%
Education	Non-literate	1.67%
	Elementary Schhool	62.50%
	Highschool	25.00%
	University Education	10.83%
Civil Status	Single	8.33%
	Married	78.33%
	Separated	9.17%
	Widow	4.17%
Income	Until 3 minimum wages	48.33%
	From 4 to 7 minimum wages	28.33%
	From 8 to 10 minimum wages	14.17%
	More than 10 minimum wages	9.17%
Pronaf	1 time	23.33%
	2 times	12.50%
	3 times	41.67%
	None	22.50%
Training	1 time	21.67%
	2 times	14.17%
	3 times	64.17%
Orientation	1 time	15.83%
	2 times	13.33%
	3 times	70.83%
Rural Credit	1 time	16.67%
	2 times	8.33%
	3 to 5 times	75.00%

Source: survey data (2023)

In terms of property size (in hectares), according to the criteria established by Special Normative Instruction n° 5/2022 issued by the National Institute for Colonization and Agrarian Reform (INCRA), two farms are classified as smallholding, 21 as small, 42 as medium, and 55 as large properties (Brasil, 2022). Based on Art. 3, I, of Law n° 11.326/2006 (Brasil, 2006), 117 properties belong to family farming because they have an area of up to 4 fiscal modules, while only three properties are classified as non-family farming because they have an area larger than 4 fiscal modules, as shown in Table 2.

Table 2. Distribution of property size and type

Parameter	Class	Frequency(%)	Size/Type
Area (ha)	From 0.01 to 1.00 ha	1.67%	Smallholdings
	From 1.01 to 4.00 ha	17.50%	Small
	From 4.01 to 14.999 ha	35%	Medium
	Over 15.01 ha	45.83%	Large
Area (Fiscal Module)	Until 4 módulos fiscais	98.33%	Familiar
	Over 4 fiscal modules	1.67%	Non Familiar

Source: survey data (2023)

4.2 Effects of ATER on livelihoods and quality of life of family farmers

To achieve this result, it was necessary to validate the research model using the collected data, employing specific criteria of PLS-SEM with the SmartPLS 4.0 software in two stages: the measurement model (external model) and the structural model (internal model), as described below.

4.2.1 Results of the measurement model validation (external model)

Since the measurement model is reflective (when constructs cause items), the first step of its validation involved examining the factor loadings of the items on their respective constructs to identify and exclude items with factor loadings below 0.6, ensuring minimum item reliability (Hair et al., 2019), while maintaining at least 3 items per construct to preserve the dimensional aspect of the measure (Ringle et al., 2014). This practice is acceptable (Ringle et al., 2014) and has been used in recent exploratory studies (Cavalcante et al., 2022; Rezende, 2023).

In the second step, construct reliability (internal consistency) was ensured through the traditional Cronbach's alpha (CA) and composite reliability (CR) using Rho_A and Rho_C measures. The former was used to assess the reliability of unidimensional constructs (first-order constructs in the model), while the latter was used for multidimensional constructs (second-order constructs) (Hair et al., 2019). In exploratory research (as in this study), CA and CR values between 0.60 and 0.70 are considered "acceptable" (Hair et al., 2019, p. 8).

In the third step, convergent validity of the constructs was assessed using the average variance extracted (AVE) criterion, ensuring that the construct explains at least 50% of the variance of its items (Hair et al., 2019). Therefore, AVE values greater than 0.5 are considered acceptable (Hair et al., 2019). In the fourth step, discriminant validity was assessed, ensuring that the constructs are independent from each other (Hair et al., 2019), applying the Fornell and Larcker criterion (Fornell & Larcker, 1981) which emphasizes that the square roots of the AVE) of each construct should be greater than the correlations between the constructs (Hair et al., 2022).

As shown in Table 3, the validation of the measurement model met all the criteria: reliability (AC and CC) > 0.6; convergent validity (AVE) > 0.5, and discriminant validity (> correlation between constructs). The AVE values are highlighted in bold on the diagonal of Table 3.

Table 3. Results of the measurement model validation process

Constructs		AC	CC (Rho a)	AVE	*Fornell-Lacker*									
					ATER			Livelihood				Q. Life		
				TC	OSR	CR	CN	CF	CH	CS	ED	MR	RE	
ATER	TC	0.861	0.868	0.593	**0.770**									
	OSR	0.879	0.881	0.679	0.274	**0.824**								
	CR	0.846	0.872	0.688	0.405	0.376	**0.830**							
Livelihood	CN	0.640	0.742	0.662	0.454	0.318	0.495	**0.814**						
	CF	0.697	0.709	0.627	0.301	0.247	0.387	0.492	**0.792**					
	CH	0.743	0.747	0.565	0.203	0.208	0.145	0.251	0.536	**0.752**				
	CS	0.909	0.922	0.689	0.155	0.606	0.214	0.227	0.253	0.211	**0.830**			
Q. of Life	ED	0.660	0.647	0.594	0.493	0.259	0.364	0.372	0.531	0.397	0.246	**0.770**		
	MR	0.779	0.812	0.628	0.379	0.236	0.491	0.379	0.441	0.193	0.175	0.477	**0.793**	
	RE	0.848	0.857	0.624	0.488	0.199	0.562	0.396	0.493	0.207	0.200	0.562	0.783	**0.790**

Source: survey results (2023). Note: TC – training and qualification, OSR – rural social organizations, CR – rural credit, CN – natural capital, CF – financial capital, CH – human capital, CS – social capital, ED – education, MR – housing, RE – income

Discriminant validity of the items was also assessed using the cross-loadings criterion to ensure that the correlation of an item with its respective construct is higher than with the other constructs.

4.2.2 Results of Structural Model Validation (internal model)

Before applying the validation criteria for the structural model (internal model), collinearity among the predictor constructs was examined based on the variance inflation factor (VIF) values to ensure that it did not influence the regression results (Hair et al., 2019). The VIF values were 1.507 for ATER and Livelihoods, below the threshold of 5.0, ensuring the absence of collinearity among predictor variables (Hair et al., 2019).

Based on these results, the validation of the structural model proceeded, using Pearson's coefficient of determination (R2), model predictive quality (Q^2), and effect size (f^2). The significance level of the path coefficients in the relationships between constructs was also evaluated based on the p-value.

R^2 measures the explained variance of the dependent constructs and is considered a measure of the explanatory power of the model (Shmueli & Koppius, 2011), with values ranging from 0 to 1. Generally, R^2 values of 0.75, 0.50, and 0.25 are considered substantial, moderate, and weak, respectively (Hair et al., 2022). However, in social sciences, R^2 values of 0.02, 0.13, and 0.26 are considered small, medium, and large, respectively (Ringle et al., 2014).

Q^2 is a metric for assessing the predictive quality (accuracy) of the structural model, and generally, Q^2 values greater than zero, 0.25, and 0.50 represent small, medium, and large predictive relevance, respectively (Hair et al., 2019). The f^2 (effect size) is used to evaluate the magnitude of the change in the value of R^2 for a dependent construct when a particular predictor construct is removed (Hair et al., 2019). Its application is recommended in cases of structural models with partial or total mediation (Nitzl et al., 2016). As a general rule, f^2 values greater than 0.02, 0.15, and 0.35 represent small, medium, and large effect sizes, respectively (Hair et al., 2019).

Table 4 displays the values of the R^2, Q^2, and f^2 coefficients for the constructs in the structural model of this study.

Table 4: Values of the validation parameters for the structural model

Variables	R^2	R^2 adjusted	Q^2
ATER	-	-	-
Training and Qualification	0.558	0.554	0.304
Social Rural Org.	0.493	0.488	0.309
Rural Credit	0.655	0.652	0.421
Livelihood	**0.336**	**0.331**	**0.163**
Natural Capital	0.523	0.519	0.326
Financial Capital	0.721	0.719	0.431
Human Capital	0.493	0.489	0.254
Social Capital	0.281	0.275	0.184
Qualidade of Life	**0.437**	**0.428**	**0.305**
Education	0.597	0.593	0.279
Housing	0.783	0.781	0.479
Income	0.845	0.843	0.522
Size of Effect on relations			f^2
ATER ➔ Livelihood			0.507
Livelihood ➔ Quality of Life			0.205

Source: survey results (2023). Note: Small predictive relevance: $0 \leq Q^2 < 0.25$; mean: $0.25 \leq Q^2 < 0.50$; large: $Q^2 > 0.50$. Small effect size: $0.02 \leq f^2 < 0.15$; medium: $0.15 \leq f^2 < 0.35$; large: $f^2 > 0.35$

Although the adjusted R^2 for Livelihoods is 0.331 and for Quality of Life is 0.428, the Q^2 values indicate that the predictive relevance of the structural model is small (0.163) for the first construct and medium (0.305) for the second construct. Nevertheless, the structural model demonstrates predictive accuracy because both Q^2 values are greater than zero.

Regarding the significance levels (p-values) of the path coefficient values in the PLS-SEM, they were obtained by running the Bootstrapping command in SmartPLS software (parameters: subsamples = 5000; significance level = 0.05). Table 5 presents the direct effects (path coefficient values) at the top, representing the magnitude of the effects and the nature of the proposed relationships in the research hypotheses. The bottom part of Table 5 shows the indirect effects, which are the path coefficient values representing the magnitude of the effects and the nature of the indirect or specific relationships between ATER and the dimensions of livelihoods and quality of life, as well as between livelihoods and the dimensions of quality of life.

Table 5. Values of path coefficients in the structural model

	Relations	Path Coefficient	Statistical Test	p-Value
Direct Effects	ATER ➔ Livelihood	0.580	7.998	0.000
	ATER ➔ Quality of Life	**0.417**	**4.122**	**0.000**
	Livelihood ➔ Quality of Life	0.326	3.297	0.001
Indirect Effects	ATER ➔ Natural Capital	0.420	5.814	0.000
	ATER ➔ Financial Capital	0.493	7.270	0.000
	ATER ➔ Human Capital	0.407	6.259	0.000
	ATER ➔ Social Capital	0.308	4.278	0.000
	ATER ➔ Education	0.468	6.923	0.000
	ATER ➔ Housing	0.536	9.216	0.000
	ATER ➔ Income	0.557	2.690	0.000
	Livelihood ➔ Education	0.252	2.912	0.004
	Livelihood ➔ Housing	0.288	3.269	0.001
	Livelihood ➔ Income	0.299	3.272	0.001

Source: survey results (2023).

It can be observed that the direct effect of ATER on quality of life is positive and significant (0.417; p < 0.01), indicating that ATER actions contribute to the improvement of farmers' quality of life, supporting the first hypothesis (H1). Similarly, the effects of ATER on livelihoods (0.580; p < 0.01) and of livelihoods on quality of life (0.326; p < 0.01) are also positive and significant, corroborating hypotheses 2 and 3. These results suggest that livelihoods is a partial mediating variable (Vieira, 2009) in the relationship ATER -> quality of life, as the strength of the ATER -> quality of life relationship, which was 0.608 (p = 0.000) before the inclusion of livelihoods, decreased to 0.417 (p = 0.000) in the presence of livelihoods.

Table 5 also shows that the indirect (specific) effect of ATER on the dimensions of quality of life is highest in income (0.557; p < 0.000), followed by housing (0.536; p < 0.000) and education (0.468; p < 0.000). The same order is observed for the specific effects of livelihoods on the dimensions of quality of life: income (0.299; p < 0.000), housing (0.288; p < 0.000), and education (0.252; p < 0.000). Similarly, the specific effect of ATER on the dimensions of livelihoods is highest in financial capital (0.493; p < 0.000), followed by natural capital (0.420; p < 0.000), human capital (0.407; p < 0.000), and social capital (0.308; p < 0.000). The results of the measurement and structural models are presented in Figure 2.

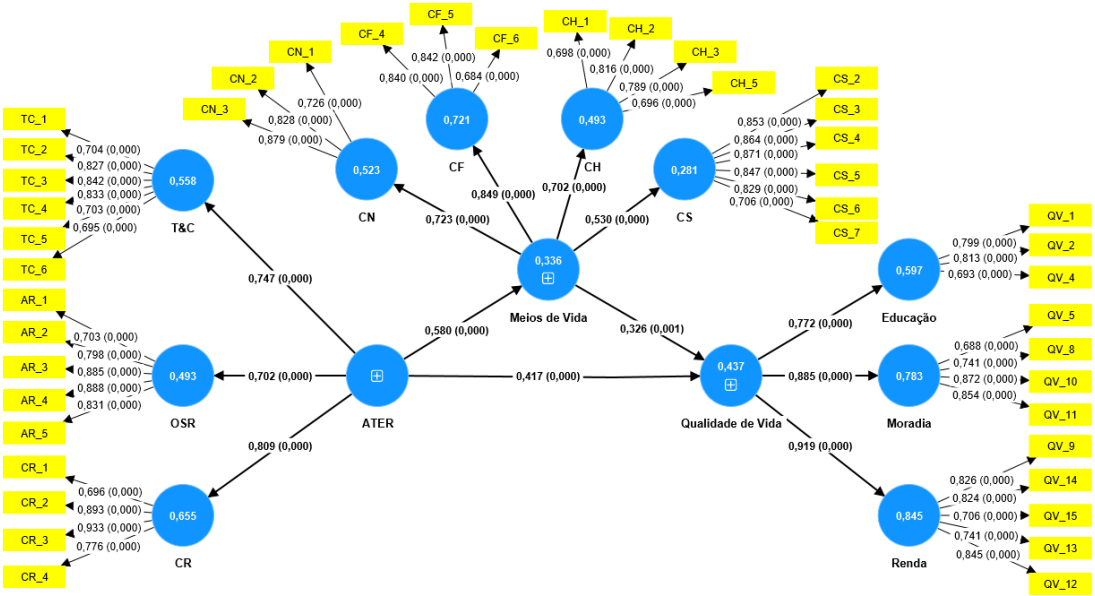

Figure 2: Results of the research's measurement and structural models.
Source: survey results (2023)

The corroboration of hypothesis 1 confirms the importance of ATER's public policy for improving the quality of life of family farmers. These findings corroborate the study by Ferreira & Khan (2010), whose results indicate a higher quality of life index (QLI) among farmers assisted by the Rural Agent Program compared to non-assisted farmers. However, this research goes beyond the study by Ferreira & Khan (2010) by showing different intensities of the specific effects (indirect effects) of ATER on the dimensions (income, housing, and education) of quality of life. In terms of income, the results confirm the contribution of ATER to increasing income and the quantity of food consumed, as well as the acquisition of vehicles and information reception equipment (radios, televisions, computers) and communication devices (rural telephones, mobile phones).

Regarding housing, there is evidence that ATER helps improve the infrastructure (construction type, electrical and plumbing installations) of the property, the sanitation system on the premises, the comfort of furniture in the house, and the quality of household utensils. In terms of education, ATER contributes to family farmers acquiring new theoretical knowledge and new technical skills, and improving the quality of the food consumed.

These results expand the ATER literature, given the scarcity of studies with similar results. The closest study (Ferreira & Khan, 2010) did not seek to highlight the specific effects of the Rural Agent Program on the indicators (health, education, housing and sanitary conditions, and economic aspects) that make up the QLI.

The corroboration of hypothesis 2 confirms the positive contributions of ATER to the improvement of the living conditions of rural producers served by Emater in the state of Goiás. With due regard for differences in measurement, this result confirms the study by Ferreira & Khan (2010), specifically the findings that show the positive effect of the Rural Agent program on the general technological index (GTI) of assisted farmers.

Going beyond Ferreira & Khan (2010), the results here highlight that ATER has a greater impact on financial capital, reflecting the efforts of extension technicians from Emater to help farmers obtain rural credit to acquire inputs (chemical and/or natural), irrigation equipment, agricultural machinery and implements, and improve property infrastructure. This is relevant evidence because, in addition to the mentioned factors, rural credit affects performance variables such as production value and gross domestic product (GDP) and variables related to technological change (Gasques et al., 2017).

Even in third place, the specific positive effect of ATER on human capital shows the contribution of ATER to increasing technical knowledge, learning new production methods, and improving farmers' experience in agricultural activities, reinforcing the findings of Cavalcante et al. (2022). This empirical evidence reinforces the importance of ATER in enhancing farmers' knowledge, especially regarding the use and management of soils, which is relevant for improving soil quality assessment techniques (Suliman et al., 2012).

The specific effect of ATER on natural capital (the second largest effect) indicates that training and qualification activities help rural producers increase soil fertility, overcome difficulties related to land topography, and increase water availability for irrigation, which is important since soil quality is a key factor for the development of sustainable agriculture (Audeh et al., 2011).

The corroboration of hypothesis 3 indicates that the quality of life of farmers is also a reflection of their livelihoods, that is, the availability and conditions of access to natural, financial, human and social capital. These results expand the evidence of Cavalcante et al. (2022) as livelihoods were used here as a mediating variable in the relationship between ATER and quality of life.

The confirmation of the mediating relationship empirically confirms that the availability, access, and use of natural, financial, human, and social capitals are determining factors for the survival of small-scale farmers (Ellis & Freeman, 2004, cited in Cavalcante et al., 2022), corroborating the premises of the theoretical Livelihoods Approach (Scoones, 2009; Carney, 2003).

The fact that income is the dimension of quality of life most affected by livelihoods makes sense, as natural and financial capitals contribute to increased productivity and improved product quality. Specifically, financial capital enables the use of technological innovations that have a positive impact on production and product quality indicators, with positive repercussions on the rural household's income (Simioni & Zilliotto, 2012).

In addition to financial capital, the farmer's level of knowledge related to experience, information gathering and processing abilities, and the capacity to use production and management techniques (represented here by human capital) is a determining factor in the adoption of technologies (Simioni & Zilliotto, 2012) and enhances the positive effects of livelihoods on quality of life, especially in terms of income and education (Simioni & Zilliotto, 2012).

6 Conclusions

In an effort to answer whether the ATER interventions carried out by Emater have positively impacted the livelihoods and quality of life of rural producers benefiting from this public policy in the state of Goiás, Brazil, this study aimed to measure the effect of ATER actions on the quality of life and livelihoods of rural producers assisted by Emater in the state of Goiás, Brazil. In addition to characterizing the profile of the farmers included in the sample, this study validated a measurement scale for ATER interventions promoted by Emater and identified which category of ATER interventions more strongly affects the livelihoods and quality of life of farmers.

The confirmation of the first hypothesis confirms the effectiveness of Emater's actions for the development of agriculture in Goiás, particularly in the family-based sector. By corroborating the second hypothesis, this study showed that ATER in Goiás strengthens aspects related to production factors, especially financial capital and natural capital, contributing positively to improving the living conditions of farmers.

The confirmation of the third hypothesis and, consequently, the role of livelihoods as a mediating variable, demonstrates that directing ATER interventions towards resources linked to natural, human, financial, and social capital contributes to enabling the conditions for farmers to sustain their rural activities and improve their quality of life.

The greater contribution of ATER to financial capital (in livelihoods) and income (in quality of life) may be a reflection of the focus that Emater has given to supporting and guiding rural credit. On the other hand, the lesser contribution of ATER to social capital (in livelihoods) may indicate that ATER in Goiás should reinforce its support for rural cooperatives and associations to increase farmers' engagement levels in production and marketing networks and in collaborative workgroups that strengthen mutual support, such as collective work initiatives, an important resource for housing and rural facility improvements.

This research has some limitations, such as the non-probabilistic sampling, which restricts the results to the participating farmers only, and the fact that the measurement scale for quality of life, despite being developed based on indicators from previous studies, did not undergo a qualitative validation process.

Despite these limitations, the results contribute to the literature on ATER, livelihoods, and quality of life by validating previous empirical evidence and adding new insights that can inform future studies, such as the validation of a specific scale to measure ATER interventions. Future research could also statistically test whether the differences between the specific effects of ATER on the dimensions of livelihoods and quality of life are significant. For Emater managers, these results provide valuable directions for reviewing and strengthening ATER policies in Goiás, Brazil.

References

Abramovay, R. (1998). Agricultura familiar e serviço público: novos desafios para a extensão rural. *Cadernos de Ciência & Tecnologia*, *15*(1), 137-157.

Audeh, S. J. S., Lima, A. C. R. D., Cardoso, I. M., Jucksch, I., & Casalinho, H. D. (2011). Qualidade do solo: uma visão etnopedológica em propriedades agrícolas familiares produtoras de fumo orgânico. *Revista Brasileira de Agroecologia*, *6*(3), 34-48.

Barry, P. J. (1995). *The effects of credit policies on U.S. agriculture*. Reino Unido: American Enterprise Institute Press.

Batalha, M. O., Buainain, A. M., & Souza Filho, H. (2005). Tecnologia de gestão e agricultura familiar. In H. M. Souza Filho & M. O. Batalha (Eds.), *Gestão integrada da agricultura familiar.* São Carlos: EdUFSCar.

Brasil. Casa Civil da Presidência da República. (2006). Lei nº 11.326, de 24 de julho de 2006. Estabelece as diretrizes para a formulação da Política Nacional da Agricultura Familiar e Empreendimentos Familiares Rurais. *Diário Oficial [da] República Federativa do Brasil*, Brasília.

Brasil. Ministério do Desenvolvimento Agrário – MDA. (2013, abril). Planejamento do Brasil rural com gente: documento de referência. In *Anais da 2ª Conferência Nacional de Desenvolvimento Rural Sustentável e Solidário*. Brasília.

Brasil. Instituto Nacional de Colonização e Reforma Agrária – INCRA. (2022). Instrução Especial n° 5, de 29 de julho de 2022. *Diário Oficial [da] República Federativa do Brasil*, Brasília. Retrieved in 2023, June 30, from https://in.gov.br/web/dou

Caporal, F. R. & Ramos, L. F. (2006). *Da extensão rural convencional à extensão rural para o desenvolvimento sustentável: enfrentar desafios para romper a inércia* (Texto para Discussão). Belém: UFPA/NAEA.

Carney, D. (2003). *Sustainable livelihoods approaches: progress and possibilities for change.* Canadá: Omar Sattaur Editor. Retrieved in 2023, June 30, from https://silo.tips/download/sustainable-livelihoods-approaches-progress-and-possibilities-for-change

Cavalcante, D. F. S., Cruz, J. E., & Medina, G. S. (2022). Getting it right in rural development initiatives: the importance of livelihood assets in commercializing family farm production in Brazil. *Human Ecology: an Interdisciplinary Journal*, *50*(1), 49-59. http://dx.doi.org/10.1007/s10745-021-00293-2

Costa, J. F. D. (2011). *Mensuração e desenvolvimento de escalas: aplicações em administração.* Rio de Janeiro: Ciência Moderna.

Crona, B., Gelcich, S., & Bodin, Ö. (2017). The importance of interplay between leadership and social capital in shaping outcomes of rights-based fisheries governance. *World Development*, *91*, 70-83.

Damasceno, N. P., Khan, A. S., & Lima, P. V. P. S. (2011). O impacto do Pronaf sobre a sustentabilidade da agricultura familiar, geração de emprego e renda no estado do Ceará. *Revista de Economia e Sociologia Rural*, *49*(1), 129-156.

Dias, M. M. (2007). As mudanças de direcionamento da política nacional de assistência técnica e extensão rural (Pnater) face ao difusionismo. *Revista Oikos*, *18*(2), 11-21.

Ellis, F., & Freeman, H. A. (2004). Rural livelihoods and poverty reduction strategies in four african countries. *The Journal of Development Studies*, *40*(4), 1-30.

Empresa Brasileira de Pesquisa Agropecuária – Embrapa. (2023). *Crédito rural.* Brasília. Retrieved in 2023, July 30, from https://www.embrapa.br/geomatopiba/sistemas/credito-rural

Felicity, D., Evan, H., & Anna, H. (2022). *Natural capital, agriculture and the law*. Reino Unido: Edward Elgar Publishing.

Ferreira, V. S., & Khan, A. S. (2010). A importância do programa agente rural e seus impactos sobre nível tecnológico, geração de emprego, renda e qualidades de vida das famílias assistidas do Estado do Ceará. *Revista de Desenvolvimento do Ceará*, (1), 1-16.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *JMR, Journal of Marketing Research*, *18*(1), 39-50.

Fukuyama, F. (1996). *Confiança: as virtudes sociais e criação da prosperidade* (1ª ed.). Rio de Janeiro: Rocco.

Gasques, J. G., Bacchi, M. R. P., & Bastos, E. T. (2017). Impactos do crédito rural sobre variáveis do agronegócio. *Revista de Política Agrícola*, *26*(4), 132-140.

Gasques, J. G., Rezende, G. C., Villa Verde, C. M., Salermo, M. S., Conceição, J. C. P., & Carvalho, J. C. S. (2004). *Desempenho e crescimento do agronegócio no Brasil* (Texto para Discussão, No. 1009). Brasília.

Guerry, A. D., Polasky, S., Lubchenco, J., Chaplin-Kramer, R., Daily, G. C., Griffin, R., & Vira, B. (2015). Natural capital and ecosystem services informing decisions: From promise to practice. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(24), 7348-7355.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* Thousand Oaks: SAGE Publications.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2-24.

Kasmin, M. A., Passini, J. J., & Boico, D. G. (2019). A importância da assistência técnica e extensão rural para agroindústrias Familiares: o caso da agroindústria de panificação no oeste do paraná. *Gestão e Desenvolvimento em Revista*, *5*(1), 84-98.

Landini, F. P. (2015). Problemas enfrentados por extensionistas rurais brasileiros e sua relação com suas concepções de extensão rural. *Ciência Rural*, *45*(2), 371-377.

Maia, S. M. B., & Sousa, E. P. (2008). Estudo comparativo da qualidade de vida dos pronafianos do grupo c e dos não-pronafianos em Santana do Cariri - CE. *Revista de Economia da UEG*, *4*(1), 18-35.

Mezomo, A. M. (2010). *Frente programática: assistência técnica e extensão rural* (31 p.). Porto Alegre: EMATER-RS: ASCAR.

Nahas, M. I. P. (2001). *Metodologia de construção de índices e indicadores sociais como instrumentos balizadores da gestão municipal da qualidade de vida urbana: uma síntese da experiência de Belo Horizonte* (pp. 465-487). Campinas: Núcleo de Estudos de População/ Unicamp.

Nascimento, J. E. B., Alcantara, F. V., Costa, J. E., & Mendes, M. A. (2018). A importância da ATER para a agricultura familiar do território do sertão ocidental de Sergipe. *Desenvolvimento Rural Interdisciplinar*, *1*(1), 138-165.

Nitzl, C., Roldan, J. L., & Cepeda, G. (2016). Mediation analysis in partial least squares path modeling: helping researchers discuss more sophisticated models. *Industrial Management & Data Systems*, *116*(9), 1849-1864.

Ostrom, E. (2000). Collective action and the evolution of social norms. *The Journal of Economic Perspectives*, *14*(3), 137-158.

Peixoto, M. (2008). *Extensão Rural no Brasil: uma abordagem histórica da legislação* (Texto para Discussão, No. 48, pp. 1-47). Brasília: Consultoria Legislativa do Senado Federal.

Queiroz, L. I. S., & Costa, V. C. (2015, agosto 25-28). Política nacional de assistência técnica e extensão rural: um caminho para emancipação da agricultura familiar. In *Anais da VII Jornada Internacional de Políticas Públicas.* São Luís.

Resende, C. M., & Mafra, R. L. M. (2016). Desenvolvimento rural e reconhecimento: tensões e dilemas envolvendo o Pronaf. *Revista de Economia e Sociologia Rural*, *54*(2), 261-280.

Rezende, R. C. (2023). *A influência de fatores comportamentais na intenção de compra do consumidor de queijos artesanais* (Tese de doutorado). Universidade Federal de Goiás, Goiânia.

Ringle, C. M., Silva, D., & Bido, D. S. (2014). Modelagem de equações estruturais com utilização do smartpls. *ReMark*, *13*(2), 56-73.

Rosa Neto, C., Silva, F. A. C., & Araújo, L. V. (2020, novembro 8). Participação da agricultura familiar na produção de alimentos no Brasil e em Rondônia. *Embrapa Notícias*, Brasília.

Scoones, I. (2009). Livelihoods perspectives and rural development. *The Journal of Peasant Studies*, *36*(1), 171-196.

Shmueli, G., & Koppius, O. R. (2011). Predictive analytics in information systems research. *Management Information Systems Quarterly*, *35*(3), 553-572.

Silva, R. P. (2014). As especificidades da nova ater para agricultura familiar. *Revista Nera*, *23*, 150-166.

Simioni, F. J., & Zilliotto, T. C. (2012). Influência das inovações tecnológicas em unidades de produção familiares da Região Oeste de Santa Catarina. *Revista de Economia e Agronegócio*, *10*(3), 419-440.

Sousa, M. C., Khan, A. S., & Passos, A. T. B. (2004). Qualidade de vida da agricultura familiar em assentamentos de reforma agrária no Rio Grande do Norte. In *Anais do 42º Congresso Brasileiro de Economia e Sociologia Rural* (Vol. 1, pp. 1-20). Brasília: SOBER.

Souza, A. B., Fornazier, A., & Delgrossi, M. E. (2020). Sistemas agroalimentares locais: possibilidades de novas conexões de mercados para a agricultura familiar. *Ambiente & Sociedade*, *23*, 1-20. https://doi.org/10.1590/1809-4422asoc20180248r2vu2020L5AO.

Suliman, B. A., Xu, D., & Williams, B. R. G. (2012). HDACi: molecular mechanisms and therapeutic implications in the innate immune system. *Immunology and Cell Biology*, *90*(1), 23-32.

Van der Ploeg, J. D., Renting, H., Brunori, G., Knickel, K., Mannion, J., Marsden, T., de Roest, K., Sevilla-Guzman, E., & Ventura, F. (2000). Rural Development: From Practices and Policies towards Theory. *Sociologia Ruralis*, *40*(4), 391-408.

Vieira, V. A. (2009). Moderação, mediação, moderadora-mediadora e efeitos indiretos em modelagem de equações estruturais: uma aplicação no modelo de desconfirmação de expectativas. *RAUSP*, *44*(1), 17-33.

Wiggins, S., & Keats, S. (2019). Leaping & learining: linking smallholders to markets. *Gates Open Research*, *3*, 798.

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