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Theoretical-empirical Article

Novelties Production and Contextual Knowledge in the RECA Project in Rondônia

Produção de Novidades e Conhecimento Contextual no Projeto RECA em Rondônia

Verlaine Alves da Cunha Ribeiro*[1]
Dércio Bernardes-de-Souza [1]
Maria Clarice Alves da Costa [1]
Sabrina Sissy Carvalho Correa Alves [1]

ABSTRACT

Objective: this article aims to analyze how contextual knowledge contributes to the production of novelty in the Association of Small Agroforestry Farmers of the Consortium and Densified Economic Reforestation Project and the RECA Project Cooperative, in the state of Rondônia, Brazil. **Theoretical approach:** in carrying out the research, alternative theoretical approaches were used, exploring a theoretical path in the various categories of knowledge and modernization in agriculture, bringing them closer to the theory of the production of novelties. **Method:** using a qualitative methodology, we opted for a case study, with data collection involving family farmers and managers of the RECA project cooperative, using semi-structured interviews and non-participant observation. **Results:** the results showed that the main innovations came from the contextual knowledge of the family farmers who, by deviating from the conventional path, came together, exchanging experiences and developing new production practices using species characteristic of the region. The cooperative has enabled farmers to establish new partnerships; develop new processes and products; increase their competitiveness and access new markets; obtain organic certification, which has resulted in greater appreciation of the product and improved awareness on the part of the farmer with regard to environmental contributions; and produce biofertilizers and organic compost based on the reorganization of internal resources. **Conclusion:** the study contributes to understanding local dynamics, reinforcing the importance of interaction between local and scientific knowledge. It identifies that the cooperative's collaborative structure not only favors the exchange of knowledge but also adaptation to local realities, contributing to the discussion in this area.

Keywords: contextual knowledge; RECA Project; cooperative; Rondônia; Amazon.

RESUMO

Objetivo: este artigo tem como objetivo analisar como o conhecimento contextual contribui para a produção de novidade na Associação dos Pequenos Agrossilvicultores do Projeto de Reflorestamento Econômico Consorciado e Adensado e Cooperativa do Projeto RECA, no estado de Rondônia, Brasil. **Marco Teórico:** na execução da pesquisa, foram utilizadas abordagens teóricas alternativas, explorando um caminho teórico nas diversas categorias de conhecimento e modernização na agricultura e aproximando-as da teoria da produção de novidades. **Método:** com metodologia qualitativa, optou-se pelo estudo de caso, com a coleta de dados que envolveram agricultores familiares e gestores da cooperativa do Projeto RECA, utilizando entrevistas semiestruturadas e observação não participante. **Resultados:** os resultados evidenciaram que as principais novidades apareceram a partir do conhecimento contextual dos agricultores familiares, que, ao desviarem do caminho convencional, uniram-se, trocando experiências, e desenvolveram novas práticas de produção, utilizando espécies características da região. A cooperativa permitiu aos agricultores estabelecer novas parcerias; fazer novos processos e produtos; aumentar sua competitividade; acessar novos mercados; obter a certificação orgânica, que resultou na maior valorização do produto e em uma conscientização aprimorada por parte do agricultor em relação à contribuição ambiental; e elaborar biofertilizantes e composto orgânico a partir da reorganização dos recursos internos. **Conclusão:** o estudo contribui para a compreensão das dinâmicas locais, reforçando a importância da interação entre conhecimento local e científico. Identifica que a estrutura colaborativa da cooperativa não apenas favorece a troca de conhecimentos, mas também a adaptação às realidades locais, contribuindo com a discussão nessa área.

Palavras-chave: conhecimento contextual; Projeto RECA; cooperativa; Rondônia; Amazônia.

* Corresponding Author.
1. Universidade Federal de Rondônia, Programa de Pós Graduação em Administração, Porto Velho, RO, Brazil.

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INTRODUCTION

Family farming plays a crucial role in food production and in promoting diversity, reflecting the local characteristics and the farmers knowledge. This alternative production system values natural resources and adopts practices that contribute to sustainability, soil restoration, and the generation of local solutions through novelties, which enable these farmers to remain active in their field (Araújo et al., 2023; Wiskerke & Ploeg, 2004).

Emerging trends and movements in alternative agricultural systems emphasize sustainability in economic, social, and environmental dimensions. Initiatives such as organic farming prioritize practices that respect ecological integrity and improve community well-being. Organic farmers have sought alternative ways to address challenges and solve daily problems, developing local solutions that allow them to participate in the market (Manfio & Pierozan, 2017). In the literature, this search for solutions is interpreted by some authors as the production of novelties (Gazolla, 2020; Neske et al., 2014; Oostindie & Van Broekhuizen, 2008; Ploeg, 2004; Simões et al., 2020).

The history of agriculture is a history of producing novelties. These novelties arise from the interpretations, observations, evaluations, and reorganizations that family farmers conduct in their context, using their local knowledge. This process generates new insights, actions, products, or recombinations that, when implemented, promote both social and natural transformations (Ploeg et al., 2004). Thus, novelties can be understood as solutions created to address local challenges.

In this process, contextual knowledge, which integrates local knowledge with scientific understanding and is shaped by the specific social, cultural, and environmental factors of each region, plays a fundamental role in producing novelties in agriculture. This knowledge enables farmers to adapt their cultivation practices to the unique characteristics of their environment, promoting innovative solutions that respect and utilize locally available resources (Coudel et al., 2023; Eshuis & Stuiver, 2005).

The issue of novelties becomes particularly relevant when considering that agricultural intensification in the Amazon is associated with serious environmental challenges, including deforestation and soil degradation. The pressure to increase production has contributed to the unsustainable exploitation of natural resources, compromising local ecosystems and essential environmental services. As production techniques become increasingly dependent on inputs and homogeneous standards, sustainable practices historically adapted to environmental particularities are being neglected (Mendonça & Luz, 2023; Rodrigues & Silva, 2019; Taraborelli et al., 2022).

The disconnection between sustainable practices and local knowledge results in significant biodiversity loss, as modern techniques often prioritize production over crop diversity (Machado et al., 2021). This study analyzes agricultural development from the perspective of an organized group of organic farmers in the Amazon, specifically in the border region between Rondônia, Amazonas, Acre, and Bolivia. The research highlights and documents a differentiated and sustainable agricultural production, interpreted through a theoretical approach that emphasizes local solutions enabling these farmers to remain active in agricultural activities through the production of novelties.

In these terms, this research addresses the following question: Given the rapid increase in the intensification and specialization of agricultural production, which has led to a disconnect between farming practices and local ecosystems, how do family farmers develop and implement solutions (novelties) considering their contextual knowledge? To answer this question, the study analyzed how contextual knowledge contributes to the production of novelties in organic farming within the Association of Small Agroforestry Producers of the Economic Reforestation Consortium and Cooperative of the RECA Project, located in the municipality of Porto Velho, state of Rondônia, Amazon, Brazil.

The literature on family farming in Brazil has advanced, but significant gaps remain concerning regional specificities and their implications for the production of novelties, particularly in the Amazon region. Research by Souza et al. (2019) revealed substantial regional differences in technology use in family farming. The South and Southeast regions, especially São Paulo, exhibit the highest rates of technology adoption, while the North and Northeast face significant challenges, with very low rates. Additionally, family farmers in the Amazon face a series of challenges limiting their access to resources, technology, and markets, impacting their capacity for production and innovation (Abreu & Watanabe, 2016; Vasconcelos et al., 2024).

Research on specific local contexts can reveal how cultural and environmental differences influence the mechanisms through which knowledge and its interactions are mobilized and transformed into practical novelties that contribute to the resilience of family farming production systems. Furthermore, the study contributes to advancing the Sustainable Development Goals (SDGs) by stimulating improvements in income and food security for local communities (SDG 1), creating jobs and income opportunities (SDG 8), and fostering partnerships with local communities (SDG 17).

Agricultural modernization: The crisis of autonomy and local knowledge

Family farming is the dominant form of agriculture worldwide, particularly in developing countries. This is due to its adaptability and capacity to effectively meet local food needs, making it a crucial part of rural economies. In regions where traditional agriculture is not predominant or accessible, family farming produces a significant portion of staple foods essential for the nutrition of local populations. Additionally, some family farmers, due to their proximity to urban centers, can provide labor to nearby economic sectors (Suárez & Infante, 2022).

It has its origins in peasantry or peasant societies; however, family farming is distinguished by presenting a different organization of labor and production (Abramovay, 1992; 1997). This 'rupture' between peasant agriculture and family farming is attributed to processes of commodification and increasing market integration, thereby deepening the incorporation of farmers into capitalist society (Plein, 2010). This agricultural model not only sustains local economies but also adapts to environmental changes, thus contributing to broader economic development (Bosc et al., 2019).

In Brazil, the term 'family farming' emerged in the mid-1990s (Schneider, 2006). According to the author, two events had a significant social and political impact on rural areas and favored the rise of this theme. The first, in the political sphere, was driven by rural social movements associated with rural unionism linked to Contag (National Confederation of Agricultural Workers). The second was a socio-political development, marked by the creation, in 1996, of Pronaf (National Program for Strengthening Family Farming), aimed at providing agricultural credit and institutional support to family farming. More recently, in 2006, the Family Farming Law was enacted, officially recognizing family farming and allowing its inclusion in official statistics (Instituto Brasileiro de Geografia e Estatística [IBGE], 2006).

Thus, family farming is understood as a production model characterized by its diversity of crops and the direct relationship between farmers and the land, promoting the production of fresh and nutritious food for communities (Batista et al., 2015; Maia et al., 2015). However, in recent decades, modern agricultural practices have intensified and replaced traditional methods, driven by technological advances and the need to increase food production (Eloy et al., 2020).

This transition from traditional, locally rooted agricultural practices to industrialized methods has significantly altered food production. This process began in the 19th century, driven by the need for economic development and rural integration into national frameworks. It was marked by the introduction of agricultural science, education, and policies aimed at increasing productivity and aligning agricultural practices with broader economic goals (Hartmann, 2022). In Brazil, it began within the historical context of the developmentalist model, evolving into a conservative modernization project characterized by the establishment of institutions such as Embrapa, state-directed production models, and the integration of technology, aiming to increase productivity and align agriculture with industrial practices (Silva & Botelho, 2014).

This modernization process is influenced by the sociotechnical regime, which shapes practices, rules, and priorities, leading to incremental changes rather than radical transformations (Wiskerke, 2003). In agriculture, this regime imposes a set of national and, sometimes, regional regulations that may directly or indirectly prescribe agricultural practices. Furthermore, sociotechnical regimes build upon previous regimes, demonstrating a specific trajectory for research and development to determine what will be produced within the 'privileged pathway for the future,' linking different levels, actors, and dimensions (Ploeg et al., 2004).

It is important to note that as agriculture became increasingly integrated into new sociotechnical regimes, it progressively became disconnected from its traditional parameters, such as local ecosystems, local knowledge, skills and craftsmanship, local specialties, social relations, and cultural repertoires, among others, which had previously defined its development trajectories (Ploeg et al., 2004).

With the modernization and incorporation of technological innovations, global food production more than doubled, thus meeting the demands of the world's population (Gazzoni, 2017; Saath & Fachinello, 2018). However, decades of research have revealed the environmental impacts of this land-use model worldwide, ranging from changes in atmospheric composition to ecosystem alterations (Foley et al., 2005), leaving a significant ecological footprint (Khan & Hanjra, 2009). Thus, the sociotechnical regime enabled modern agricultural land-use practices within the production system, which contributed to short-term increases in food production but resulted in long-term losses in ecosystem services essential to agriculture (Foley et al., 2005).

Dissociated from this logic, movements and trends have emerged that value productive alternatives distinct from conventional agricultural production systems, often based on novelties as 'deviations' from the logics and trajectories originating in agricultural modernization, (Gazolla, 2020; Long & Ploeg, 2011; Neske et al.,

2014; Simões et al., 2020). These novelties can serve as the foundation for these alternative production systems, mediated by cultural repertoires, agricultural work processes, and associated local knowledge. They represent an alternative trajectory for offering differentiated foods, whose production and processing practices are guided by principles of economic, social, and environmental sustainability at local or regional levels (Bloch, 2008).

The importance and prominence that more sustainable production systems are receiving stem primarily from issues related to population growth, depletion of natural resources, soil infertility, environmental problems, most notably climate change, and changes in consumer behavior (Gava et al., 2014; Safarzyńska et al., 2012). Within this context, organic food production systems — a system designed to produce food with minimal harm to ecosystems, animals, or humans — have been developed and are frequently proposed as a solution (Seufert et al., 2012), representing an alternative to conventional agricultural production systems.

According to the International Federation of Organic Agriculture Movements (International Federation of the Organic Agriculture Movement [IFOAM], 2008), organic agriculture is a production system that promotes the health of soils, ecosystems, and people. It is based on ecological processes, biodiversity, and cycles adapted to local conditions as an alternative to the use of inputs with adverse effects. Organic agriculture combines tradition, innovation, and science to benefit shared environments, foster fair relationships, and ensure a good quality of life for all those involved.

The organic food production system has expanded rapidly in wealthy European countries and the United States of America and has come to be seen as a mechanism for development in regions where small production units prevail, such as Brazil (Organics Brasil, 2016). The growing number of organic producers in the country can be divided into two groups: small family producers linked with associations and social movement groups, and large-scale corporate producers tied to private companies.

The production of novelties in agriculture is a highly localized process, where existing routines are altered through cycles of observation, interpretation, reorganization, and evaluation, leading to the discovery and/or creation of new ways of doing and thinking (Ploeg et al., 2004). In the case of organic production, organic farmers have sought alternative ways to address daily challenges and find solutions to their problems, creating local solutions that enable them to participate in the market. These alternative solutions in organic family farming can be interpreted as the production of novelties (Gazolla, 2020).

A perspective on the production of novelties

Over the centuries, farmers have introduced small modifications to the production process, either intentionally or unintentionally. These modifications are referred to as the production of novelties and can be argued to be inherent to agriculture, forming part of the continuous transformation of both the social and the natural (Oostindie & Van Broekhuizen, 2008; Ploeg et al., 2004).

The production of novelties is intrinsic to agriculture as a process of co-production, involving continuous learning and adaptation that fosters innovation through the interaction of various components within the agricultural system. This interconnectedness highlights the significance of ecological relationships, reliant on the balance among ecosystem components, and reflects the impact of farmers' decisions. These decisions are shaped by social, economic, and cultural factors and illustrate diversity through family farming and agroecological practices, blending traditional knowledge (Farias & Costa, 2024; Ploeg et al., 2004; Silva & Dorneles, 2022).

Novelties are not entirely new to agriculture; in some cases, they may consist of new production techniques that farmers adopt for management purposes, creating and reformulating their practices in response to daily challenges, problems, or circumstances. Recognizing farmers' practices and local knowledge for solving everyday problems enables the enhancement of agricultural production and practices, fostering a closer integration of scientific and traditional knowledge (Gazolla, 2020; Oliveira et al., 2011; Simões et al., 2020; Wiskerke & Ploeg, 2004).

Through farmers' knowledge and empirical experience, novelties can encompass broader dimensions, including new technological forms, processes and/or products, markets, organizational structures, or knowledge. These novelties have multidimensional effects (Wiskerke & Ploeg, 2004). Farmers can influence the dynamics of development by accelerating, neutralizing, modifying, resisting, or even reversing market-driven tendencies, thus offering diverse responses to adverse conditions (Oliveira et al., 2011).

In this perspective, contextual knowledge gains prominence. It stems from the socioeconomic and institutional settings in which farmers operate and represents the intersection of farmers' worlds with those of other social actors, such as researchers, extension workers, environmentalists, and consumers. The generation of contextual knowledge fundamentally relies on local knowledge, whereby farmers refine their practices and methods, enhancing or creating new knowledge through interactions with other stakeholders (Coudel et al., 2023; Eshuis & Stuiver, 2005). This knowledge is an accumulation

of skills and capabilities, including technological resources, developed within a specific context (Oostindie & Van Broekhuizen, 2008).

The pursuit of alternative solutions through the production of novelties involves contextualization, internalization, and territorialization. These processes enable farmers to adapt external knowledge and technologies to their unique local contexts (Oliveira et al., 2011). Based on these characteristics, Figure 1 presents an analytical framework for understanding the process of novelty production in organic family farming.

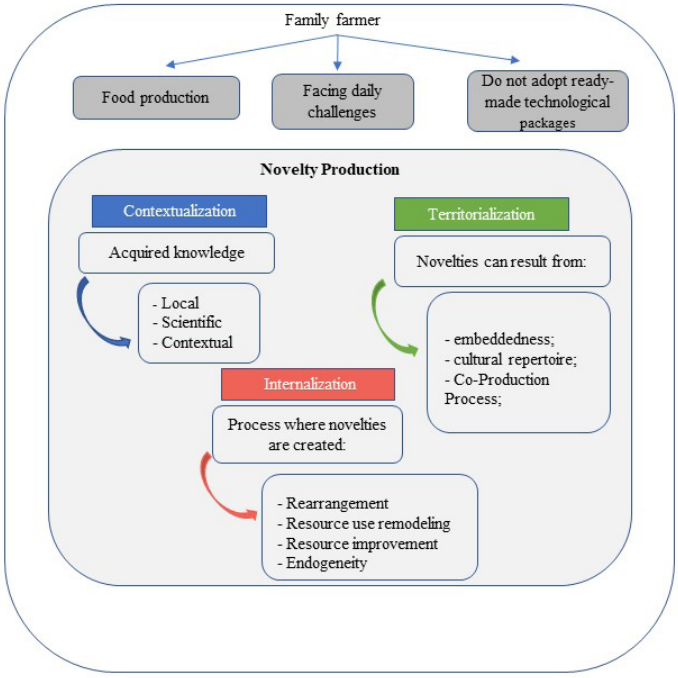

Figure 1. Theoretical-Analytical Framework.

Source: Elaborated by the Authors. Basead on: Stuiver, M., & Wiskerke, J. S. C. (2004). The VEL and VANLA environmental co-operatives as a niche for sustainable development. In J. D. van der Ploeg & J. S. C. Wiskerke (Eds.), *Seeds of transition: Essays on novelty production, niches and regimes in agriculture* (pp. 119–148). Royal Van Gorcum.; Stuiver, M. (2008). *Regime change and storylines: A sociological analysis of manure practices in contemporary Dutch farming* (Doctoral dissertation). Wageningen University. https://edepot.wur.nl/16320; Eshuis, J., & Stuiver, M. (2005). Learning in context through conflict and alignment: Farmers and scientists in search of sustainable agriculture. *Agriculture and Human Values, 22*, 137–148. https://doi.org/10.1007/s10460-004-8274-0; Stuiver, M., Leeuwis, C., & van der Ploeg, J. D. (2004). The power of experience: Farmers' knowledge and sustainable innovations in agriculture. In *Seeds of Transition: Essays on novelty production, Niches and Regimes in Agriculture* (pp. 93–118). Van Gorcum.; Ploeg, J. D. van der, et al. (2004). On regimes, novelties, niches, and co-production. In J. D. van der Ploeg & J. S. C. Wiskerke (Eds.), *Seeds of transition: Essays on Novelty production, niches and regimes in agriculture* (pp. 1–28). Royal Van Gorcum.; Roep, D., & Wiskerke, J. S. C. (2004). Reflecting on novelty production and niche management in agriculture. In J. S. C. Wiskerke & J. D. van der Ploeg (Eds.), *Seeds of transition: Essays on novelty production, niches and regimes in agriculture* (pp. 341–356). Assen, The Netherlands; Wiskerke, J. S., & Ploeg, J. D. van der (2004). Seeds of transition: Essays on novelty production, niches and regimes in agriculture. Royal Van Gorcum; Oostindie, H. A., & Van Broekhuizen, R. E. (2008). The dynamics of novelty production. In *Unfolding webs: The dynamics of regional rural development* (pp. 68–86). Koninklijke Van Gorcum; Ventura, F., & Milone, P. (2004). Novelty as redefinition of farm boundaries. In *Seeds of Transition: Essays on Novelty Production, Niches and Regimes in Agriculture* (pp. 57–92). Van Gorcum.; Gazola, M., Pelegrini, G., & Cadoná, L. A. (2010). A produção de novidades na agricultura: O caso das agroindústrias familiares. *Revista de Economia e Sociologia Rural, 48*, 1–20. and Toledo, V. M. (2015) *La racionalidad ecológica de la producción campesina.* Universidad Nacional de México.

The novelty can emerge at the boundary between the known and the unknown, potentially being new knowledge or an unexpected outcome of a trial-and-error process, as novelties go beyond existing regularities (Oostindie & Van Broekhuizen, 2008). In this sense, contextualization is associated with the knowledge and skills that farmers use for generating novelties, primarily using contextual knowledge derived from the socioeconomic, cultural, and institutional context. Internalization defines the resources used for producing novelties, which are typically local, internal resources, thus potentially making the novelty more profitable. Territorialization involves the territory, time, moment, local ecosystem, and the social networks of that moment (Oliveira et al., 2011; Oostindie & Van Broekhuizen, 2008).

The production of novelties is also seen as a consequence of the co-production between humans and nature (Wiskerke & Ploeg, 2004). It may be linked to new institutional arrangements, such as cooperatives aimed at improving relationships between farmers and the state, through new forms of regulation designed to reduce existing institutional barriers. Another important factor may be the creation of trust networks. This can occur through a new production process or the integration of two or more different activities (Oostindie & Van Broekhuizen, 2008).

The process of novelty production can be considered continuous and is based on three constructs — contextualization, internalization, and territorialization. However, identifying novelty production is quite challenging and can only be carried out through empirical field investigation, though its characteristics facilitate understanding during research, following the practices of the interviewees in the development of actions. To achieve this, there is a need for meticulous empirical observation of the farmers' processes and routines.

METODOLOGY

The qualitative method in its analysis considers that individuals construct a particular description of their practices, making it the most appropriate for the present research (Abdal et al., 2016). The research strategy was the case study, examining contemporary events to uncover meanings within their natural environment (Yin, 2001). Regarding the objectives, the research is characterized as descriptive, as the intent is to observe and describe the production of novelties, the perception, and the local/contextual knowledge of family farmers regarding the process and their skills, gathering all elements to describe the phenomenon (Creswell, 2014).

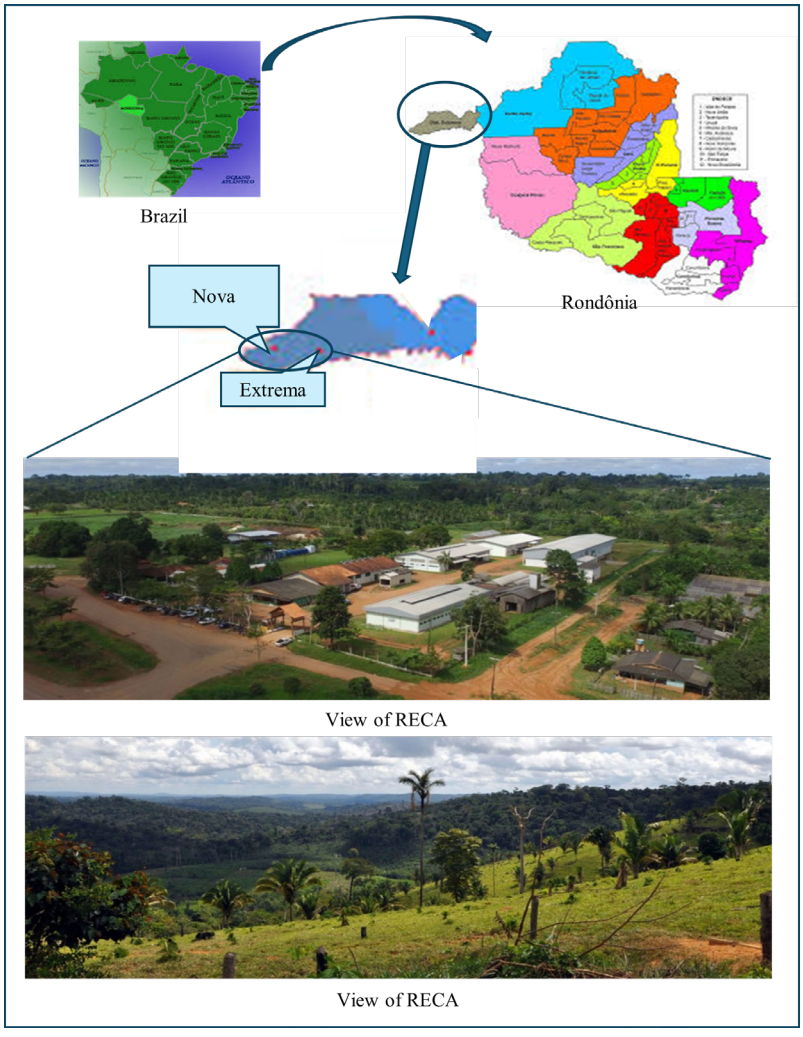

Figure 2. Location of RECA.
Source: Research data (2020).

The research locus was defined as the RECA Project, which demonstrates a success story, given its national and international visibility, to investigate the production of novelties. In the 1980s, a group of 86 farmers from various parts of Brazil, mostly from the South and Northeast, came to the Abunã region, in the Nova Califórnia district, in Porto Velho, in the state of Rondônia, to one of the settlements of INCRA (National Institute of Colonization and Agrarian Reform). The colonization projects of INCRA brought a large number of small farmers to the state of Rondônia. However, since the early 2000s, family farmers have had to face several significant transformations, such as the expansion of soybean cultivation from northern Mato Grosso, the construction of national beef export chains, and the operation of logging companies, which contributed and continue to contribute to the increase in deforestation and the devastation of natural resources (Binsztok, 2008).

When these farmers arrived, attracted by the dream of providing for their families and descendants, they were first forced to clear about 50% of the forest, then they faced the state's negligence in land distribution and abandonment, leaving these families without provisions and resources to produce on the new land (Binsztok, 2008).

Their properties were located far from the urban centers of Porto Velho, Rondônia, and Rio Branco, Acre. Noticing that they were forgotten and far from everything, they decided to practice what they had in their homeland: rice, coffee, and bean cultivation. They quickly realized that the climate and soil of the Amazon were not suitable for those crops. All their work turned into extensive deforestation and frustration. Another aggravating factor was the lack of roads, and the little production was transported by carts and bicycles (Santos et al., 2018).

Faced with all these and other problems, the farmers joined forces with rubber tappers from the region and received support from the Pastoral Land Commission (CPT) and the Diocese of the Catholic Church in Rio Branco. Together, they created the RECA Project, aiming to work with plants already adapted to the region. Initially, they cultivated rice, beans, cocoa, corn, and coffee, which were the crops they knew from the South of the country. They also introduced native Amazon species such as pupunha (*Bactris gasipaes*), cupuaçu (*Theobroma grandiflorum*), and Brazil nut (*Bertholletia excelsa* H.B.K.) in these areas. They realized that these trees would provide shade for the farmers during their planting work (Santos et al., 2018).

This process was made possible through the knowledge and experience of the local inhabitants and the association system brought by the southern farmers. Over time, they began to organize themselves by creating specific groups for each existing trail, with each trail having an association with a leadership.

Considering this case, data collection was defined through recorded semi-structured interviews, observation, field diary for monitoring activities on the units, and secondary data (photographs, maps, videos, and others) (Saunders et al., 2012).

The interview is a widely used technique in social sciences, being a more flexible form of data collection (Gil, 2010), where the researcher asks questions face to face with the interviewee based on a semi-structured script, with the aim of obtaining relevant data for the research. In the present study, the semi-structured interviews followed a predetermined instrument made up of open-ended questions, adapted to the interviewees' reality, the context, or based on the conversations to make more sense to the interviewee.

The interviews were conducted in November 2020 and had an average duration of 1 hour. They were recorded, stored separately in the cloud to maintain the confidentiality and anonymity of the participants, and to prevent loss or damage. They were then transcribed in a naturalized manner in full and subsequently analyzed (Guerra, 2010; Oliver et al., 2005). A total of 11 interviews were conducted, as shown in Table 1. Of these, nine were semi-structured interviews with family farmers who were members or cooperators of the project, as follows: (1) two pioneer farmers of the project; (2) one farmer who arrived shortly after the project began; (3) four of the interviewees are children of farmers, raised in the region, who left to study agricultural technical specialties, returned to assist their parents, and are now also producers; (4) two interviewees who arrived later. Additionally, two interviews were conducted with the managers of the cooperative about the process of producing novelties, where the novelties were reported and demonstrated to assist the farmers.

A representative sampling was used only for the interviews, following the saturation criterion, and no new interviewees were included as the data became repetitive (Saunders et al., 2012). In this regard, the researchers followed certain procedures to determine the number of interviewees and interviews, as described by Morse (2000). Both Morse (2000) and Johansen and De Cock (2017) suggest an interval of six to ten as sufficient for a homogeneous population with similar questions for all interviewees.

The interviews were conducted in person, with the purpose of understanding the process of developing the production of novelties, where they were able to explain in detail the entire process.

Table 1. Codes and characteristics of the interviewees.

Code	Gender	Age	Family Origin
A1	Male	78	South
A2	Male	57	South
A3	Female	24	South — Born in the region
A4	Male	39	Northeast
A5	Female	44	South
A6	Female	58	South
A7	Male	51	Southeast
A8	Male	61	South
A9	Male	40	South
G1	Male	40	South
G2	Male	40	South

Note. Source: Research data

The observation in this research was of the non-participant type, with the researcher being detached from the interviewees or the investigated process, not interacting with the object, aiming to observe the relationship between the family farmer and the process of producing novelties, without a direct connection, making notes in a field diary of records of behaviors and human occurrences involved (Creswell, 2014). The data collected through observation helped confirm the interview and document data.

For data analysis, the thematic analysis method proved to be the most suitable. The MAXQDA Analytics 2020 software was used, which is an academic tool for qualitative and mixed-methods data analysis. First, the interview transcriptions, documents (which were inserted and categorized as images), and document notes, such as general data, were entered and grouped. Next, a list of codes was created with the categories and constructs, including a brief explanation of each code. Relevant excerpts from the interviews were selected, according to the pre-established categories and documents. A rereading of the coded excerpts was then conducted to verify the categories, which were confirmed.

RESULTS AND DISCUSSION

The research data shows that the RECA Project is an agroforestry initiative aimed at supporting family agricultural production, with its primary goal being commercial production. The RECA Project seeks to help reduce local deforestation by assisting local family farmers in improving their technical skills in production, promoting an agroforestry model with added value, and improving the quality of life of these farmers, who were once marginalized in the Amazon rainforest.

Interviewee A1 reported that when he first arrived in the region, he felt deceived by what he had seen on television at the time, as the advertisement stated that INCRA would provide 40 hectares of land for each farmer and that the region would have a Rural Urban Assistance Center (NUAR). These centers would have schools, healthcare posts, markets, all maintained by INCRA. However, upon arriving in the region, he encountered a different reality, having to walk 50 km on foot to reach the rural property, with no road infrastructure or amenities.

Foi citado que o conhecimento local que eles tinham não se encaixava ao novo local em que eles agora estavam. Alguns começaram a plantar agricultura branca, que era a técnica conhecida, e assim plantaram arroz, feijão e milho. Porém, o clima e o solo se mostraram não favoráveis para tais culturas. Encontraram barreiras para escoar o que conseguiam produzir devido à falta de infraestrutura, então, tiveram que desmatar mais a floresta para tentar sobreviver.

New arrivals in the region began to meet through the church, where small groups formed around common interests, such as card games, football, and small trade. This account can be understood as the formation of an emerging social network in the region, where the church acts as a space for interaction and sociability, allowing farmers to establish connections and create a sense of community. According to Aguilar-Gallegos et al. (2015) and Chiffoleau (2005), these social networks help small farmers find solutions and spread their knowledge.

In conversations within these groups, some local residents participated, as well as a person from EMBRAPA and some technicians who discussed cupuaçu.

> "When I came here, I didn't know açaí, I didn't know Brazil nuts, I didn't know andiroba, I didn't know copaíba, and much less cupuaçu" (A7).

> "I had never heard of cupuaçu" (A9).

Some farmers then sought guidance from rubber tappers to understand the agricultural production of the region. The farmers from southern Brazil had experience in associativism, while the local farmers had knowledge about productive crops suitable for the area. These conversations, supported by Dom Moacir (Bishop of Rio Branco, Acre), inspired the group to initiate the RECA Project. Dom Moacir encouraged the group of farmers to draft a project, leading to the establishment of the Association of Small Agroforestry Farmers of RECA in 1989. After several meetings, the Dutch organization CEBEMO (Catholic Organization for Joint Financing of Development Programmes) decided to finance the project.

The project's inception reveals a process marked by trial and error, as noted by Oostindie and Van Broekhuizen (2008). Furthermore, as Roep and Wiskerke (2004), mention, this phase can be characterized as a 'deviation from the path,' indicating that the project's development did not follow a rigid or predictable plan. Instead, it was shaped by the specific local circumstances and the interactions among the participants involved.

The knowledge acquired, as reported by most interviewees, results primarily from the exchange of information among farmers. These interactions occur in various contexts, such as informal conversations and meetings, where farmers share experiences, challenges, and solutions. Additionally, participation in courses, training, and capacity-building significantly contributes to this knowledge formation. The exchange of information with other social actors in the local environment, such as extension agents, researchers, and cooperative representatives, also enriches this process.

These interactions and exchanges of experiences are fundamental for building contextual knowledge, as stated by Eshuis and Stuiver (2005). This construction is not limited to individual learning but expands to a collective foundation, where knowledge is adapted to local conditions and the specific needs of the farming community.

Oostindie and Van Broekhuizen (2008) drawing from Nonaka and Takeuchi (2008) and Belussi and Pilotti (2000) identify four critical learning processes (Table 2) that flow together to create contextual knowledge: (1) socialization; (2) externalization; (3) recombination; (4) internalization.

Table 2. Contextual knowledge in the RECA Project.

Stages	Theoretical basis	Findings
Socialization	The actors share their tacit knowledge with one another.	Knowledge based on the experience of older farmers (meetings, conversations).
Externalization	Tacit knowledge is transformed into codified knowledge, enabling its diffusion beyond the original group.	They learned from their parents, in courses, and at agricultural schools.
Recombination	The reuse of various sources and tacit and codified knowledge enables the creation of new knowledge through networks and other connections.	Those who arrived later learned from those who were already part of the process; and the acquired knowledge was adjusted to the results and re-adjusted to their reality.
Internalization	The means by which external knowledge, perhaps codified, is absorbed, transforming it again into tacit knowledge within the context.	The knowledge was made possible through partnerships via the cooperative.

Note. Source: Research data.

Part of the knowledge of some farmers came through experimentation, which is where the process of externalization occurs (where tacit knowledge can be disseminated beyond the original group). Some farmers later joined the cooperative and had the opportunity to learn, demonstrating the process of recombination (where the reuse of various sources happens, making it possible to create new knowledge through networks) (Oostindie & Van Broekhuizen, 2008).

"In my case, I grew up here, with my parents, helping and learning since then. And then I went to study at the agricultural school" (A3).

"I took some courses, but it's more about this day-to-day practice, seeing the farmer doing it, talking" (A4).

"Since I came here, I participated in everything, you know, everything that was a meeting, I just stayed listening" (A9).

The cooperative provides the farmer with what are called trust networks (Oostindie & Van Broekhuizen, 2008). This happens through group meetings, field days, and exchanges of experiences, strengthening their grounding.

> "Field days, we meet, discuss a lot, and exchange ideas. A producer visits us, a producer with more experience. We talk, and we improve" (A7).

The results indicate that the cooperative and the association are the main ways through which the group of farmers continues to seek new practices. The cooperative facilitates the process of rooting, providing connections for farmers with other actors through relationships and networks. It is through the cooperative that product commercialization with the market takes place. The cooperative has a structure of four agro-industries: (1) preserved pupunha palm heart; (2) fruit pulp; (3) vegetable oils; (4) processing of pupunha seeds. The cooperative, therefore, acts as the sales agent for the farmers' production.

The cooperative seeks alternative innovations with various partners such as NGOs, EMBRAPA, universities, Natura, among others, through new research, so that the cooperative can improve its production, remodel its resources, and open new markets. At the time of the interviews, the vice-director reported that the cooperative had succeeded in getting a project approved with Federal University of Acre — UFAC and the Ministry of Agriculture for students in Agronomy and Veterinary Medicine courses.

From the beginning, the project aimed to work with agroforestry systems as a primary means of both financial and economic survival. Initially, the farmers were unaware of agroforestry systems (AFSs) and began seeking knowledge through interactions with other local farmers and by participating in courses. According to interviewee G1, AFSs provide vegetation cover similar to that of a forest, allowing the soil to maintain its fertility for a longer period, recycling organic waste and nutrients, which is beneficial for some soils in the Amazon that have low fertility. AFSs were essential for the subsistence and income generation of the RECA family farmers, and especially for contributing to soil conservation, environmental protection, and local biodiversity.

They were also developing a pilot project for impact investment on a RECA property, with research and technology supported by the Vale fund from Vale do Rio Doce. The project will target a property with low production and implement technologies through sustainable arrangements, offering both economic and environmental perspectives. If the project is successful, other farmers will observe the results and be motivated to transition to organic farming as well. This project can be seen as the production of novelty (Oostindie & Van Broekhuizen, 2008; Wiskerke & Ploeg, 2004), as it breaks the limiting barriers of the region, creating new arrangements and new production processes.

Another way the RECA Project differs, as pointed out by the interviewees, is through organic certification. The data showed that the transition from conventional to organic certification was not a simple process; farmers had to adapt to various rules and standards required by the certifier Biodynamic Institute Certification Association — BICA. Many farmers already recognized that conventional practices were harming the land, creating a need to change their approach and take a different direction. The shift to organic certification brought many benefits to the cooperative and, especially, to the farmers. Natura was the partner and a major promoter of the certification. The cooperative informed that they planned to have 100% of farmers certified organic by 2024.

At the time of data collection, the cooperative was producing organic compost from the existing waste. The waste had previously been a problem for everyone, seen as garbage. The factory processed the fruits and had to discard the peels. Initially, it was discarded in other areas, until the cooperative bought a piece of land next to its headquarters and began depositing the waste there. However, they mentioned that it was a challenge for everyone, as the waste from the nuts and cupuaçu shells attracted rodents, cockroaches, insects, and bad smell from the leachate.

The organic compost is made from the cupuaçu and nut shells, açaí seeds, and palm heart husks, all crushed, using the ingredients in the right amount, determined by a research study. Currently, the cooperative produces biofertilizers using the ingredients available in the properties. This product is sustainable, inexpensive, and easy to make. It would be very expensive for a farmer to purchase it on their own. However, the fact that it is produced by the cooperative empowers the farmers, as emphasized by interviewee G2. In biofertilizer production, the cooperative provides training to help producers learn how to make their own biofertilizers, as some farmers don't always have the resources to do it, others lack the time, and some find it too difficult. The cooperative was able to buy the necessary materials for production through a project.

For the emergence of novelties, it is essential to understand the farmer's knowledge in solving their daily problems (Oliveira et al., 2011; Wiskerke & Ploeg, 2004), hrough their observations, interpretations, and evaluations of the culture and context (Ploeg et al., 2004), This knowledge can involve new techniques in production management (Oliveira et al., 2011), potentially breaking a dominant technological regime (Wiskerke & Ploeg, 2004) or modifying routines to provoke new practices (Ploeg et al., 2004).

Farmers were able to produce novelties through their contextual knowledge, supporting the authors who presented contextual knowledge as a combination of local knowledge with scientific knowledge (Oostindie & Van Broekhuizen, 2008). This knowledge served as the foundation for their productive practices (Oliveira et al., 2011), and interaction with other involved actors (Stuiver et al., 2004) may have contributed to the development of novelties.

The knowledge, primarily passed from parent to child, combined with the technical-scientific knowledge acquired in specialized schools, can contribute to breaking dominant patterns, enabling greater changes in the context (Oostindie & Van Broekhuizen, 2008; Ventura & Milone, 2004; Wiskerke & Ploeg, 2004). Those farmers who did not want to work under the project's guidance grew older and lacked successors, as similar results were found in other studies, such as Mello and Schneider (2013).

Agroforestry systems (AFSs) and organic certification were crucial factors for the RECA Project, in partnership with Natura, to implement the carbon credit project with the Amazon Fund. This initiative not only supported the cooperative but also benefited family farmers, both financially and in terms of knowledge and learning. Farmers were encouraged to maintain practices that promote environmental preservation, aligning their productive activities with sustainability (Altieri, 2004; Hinrichs, 2014).

Another innovation developed within the cooperative is the production of biofertilizer and organic compost. According to Kroma (2006), this type of solution seeks to conserve resources through the recycling of natural inputs and the remodeling of existing local resources, resulting in soil and environmental conservation. This practice can be seen as an innovation, as it involves the remodeling and improvement of resource use by utilizing the farmers' own residues, fostering a

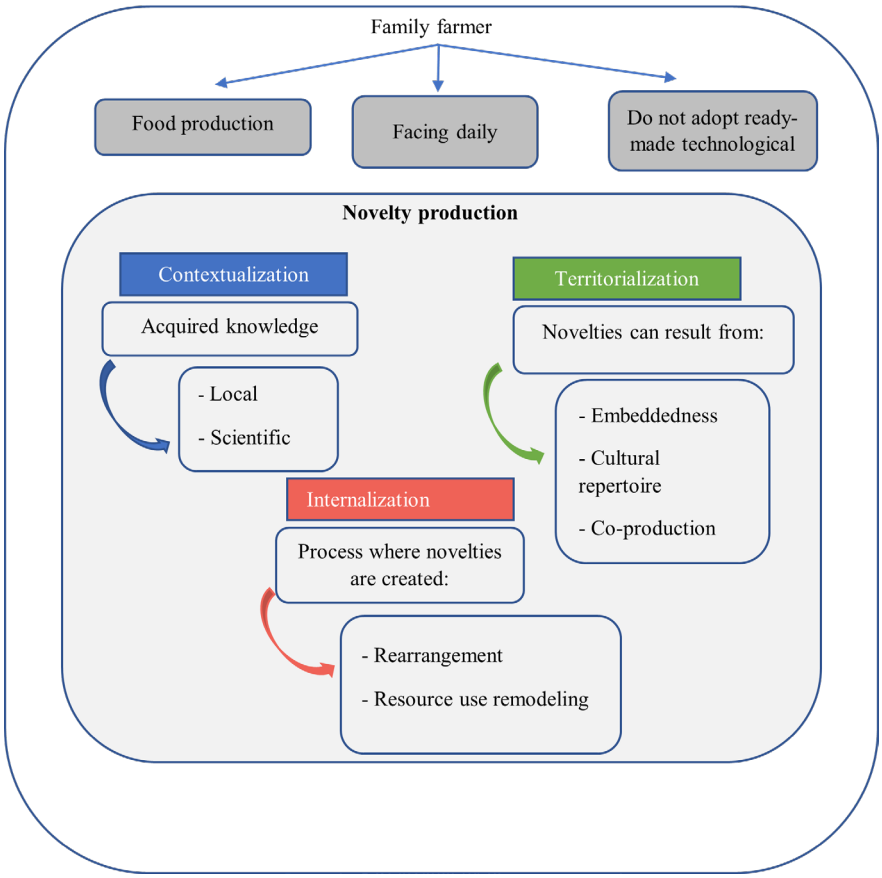

Figure 3. Summarizes the results found in the research.

Source: Research data. Elaborated by the Authors. Based on: Stuiver, M., & Wiskerke, J. S. C. (2004). The VEL and VANLA environmental co-operatives as a niche for sustainable development. In J. D. van der Ploeg & J. S. C. Wiskerke (Eds.), *Seeds of transition: Essays on novelty production, niches and regimes in agriculture* (pp. 119–148). Royal Van Gorcum.; Stuiver, M. (2008). *Regime change and storylines: A sociological analysis of manure practices in contemporary Dutch farming* (Doctoral dissertation). Wageningen University. https://edepot.wur.nl/16320; Eshuis, J., & Stuiver, M. (2005). Learning in context through conflict and alignment: Farmers and scientists in search of sustainable agriculture. *Agriculture and Human Values, 22*, 137–148. https://doi.org/10.1007/s10460-004-8274-0; Stuiver, M., Leeuwis, C., & van der Ploeg, J. D. (2004). The power of experience: Farmers' knowledge and sustainable innovations in agriculture. In *Seeds of Transition: Essays on novelty production, Niches and Regimes in Agriculture* (pp. 93–118). Van Gorcum.; Ploeg, J. D. van der, et al. (2004). On regimes, novelties, niches, and co-production. In J. D. van der Ploeg & J. S. C. Wiskerke (Eds.), *Seeds of transition: Essays on Novelty production, niches and regimes in agriculture* (pp. 1–28). Royal Van Gorcum.; Roep, D., & Wiskerke, J. S. C. (2004). Reflecting on novelty production and niche management in agriculture. In J. S. C. Wiskerke & J. D. van der Ploeg (Eds.), *Seeds of transition: Essays on novelty production, niches and regimes in agriculture* (pp. 341–356). Assen, The Netherlands; Wiskerke, J. S., & Ploeg, J. D. van der (2004). Seeds of transition: Essays on novelty production, niches and regimes in agriculture. Royal Van Gorcum; Oostindie, H. A., & Van Broekhuizen, R. E. (2008). The dynamics of novelty production. In *Unfolding webs: The dynamics of regional rural development* (pp. 68–86). Koninklijke Van Gorcum; Ventura, F., & Milone, P. (2004). Novelty as redefinition of farm boundaries. In *Seeds of Transition: Essays on Novelty Production, Niches and Regimes in Agriculture* (pp. 57–92). Van Gorcum.; Gazola, M., Pelegrini, G., & Cadoná, L. A. (2010). A produção de novidades na agricultura: O caso das agroindústrias familiares. *Revista de Economia e Sociologia Rural, 48*, 1–20. and Toledo, V. M. (2015) *La racionalidad ecológica de la producción campesina.* Universidad Nacional de México.

sustainable alternative practice (Cannarella & Piccioni, 2011; Hinrichs, 2014; Ploeg et al., 2004). Overall, it is evident that the cooperative provided a space (niche) where the production and development of innovations could take place.

It is worth mentioning, based on the interviews, that the advancement of cattle farming in the region was identified by interviewees as a challenge for the project. According to interviewee G1, cattle farming represented and still represents the 'second economic phase of the region, second only to logging.' For the interviewee, the issue with cattle farming is that it has been implemented unsustainably, being less productive and causing environmental impacts. In their view, producers use extensive tracts of land for cattle farming, which can lead to impacts such as obstructing water sources and cutting down trees. They further noted that producers lack long-term awareness of the damages that will occur later. This high demand for natural resource use is also discussed by Oliveira et al. (2011) and Foley et al. (2005) in relation to the intensive use of soil and how it has been altering the environment.

FINAL CONSIDERATIONS

This research aimed to analyze how contextual knowledge contributes to the production of novelties in organic agriculture at the Association of Small Agroforestry Farmers of the Consortium and Densified Economic Reforestation Project and RECA Project Cooperative, located in the municipality of Porto Velho, state of Rondônia, in the Brazilian Amazon. It was concluded that the theory of novelty production proved adequate to understand and analyze the reality of family farmers involved in the RECA Project, as well as their work methods. This theory played an essential role in understanding the changes that occurred, offering a detailed description of how farmers overcame their challenges and followed an alternative path, making the RECA Project a regional reference in the production of novelties.

The creation of the cooperative proved significant, as it enabled various advances and important steps that have occurred and will continue to occur. Additionally, the cooperative facilitated partnerships that were fundamental to the project's success. Group cohesion was critical for the success of the association and the cooperative, and the contextual knowledge built allowed the production implemented at the beginning of the project to be adapted to the local context, with farmers continuing to seek improvements.

The production of novelties included the remodeling of resources and internal residues, as reported in the production of biofertilizers and organic compost. By transforming residues into valuable resources, the cooperative not only reduces costs and promotes sustainability but also strengthens the agricultural community, contributing to a more sustainable future. Moreover, the novelties of the RECA Project were fostered at various stages through partnerships and social networks.

The theoretical contributions derived from the research results are significant for the literature related to family farming and novelty production. The application of the theoretical framework by Oostindie and Van Broekhuizen (2008) demonstrated the relevance of the theory of novelty production in understanding local dynamics, reinforcing the importance of the interaction between local and scientific knowledge. The results show that the cooperative's collaborative structure not only fosters knowledge exchange but also adaptation to local realities, contributing to discussions in this field. It also promotes a broader dialogue between theory and practice in rural settings, especially in Amazonian contexts.

The practical and managerial contributions that can be drawn from this research's results for the Amazon sector are as follows: (1) first, the farmers' ability to adapt to new situations, combined with group cohesion, highlights the importance of fostering a collaborative environment, which can be replicated in other cooperatives; (2) the creation of the cooperative not only facilitated product commercialization but also strengthened strategic partnerships, such as with Natura, essential for the project's growth; (3) courses and training sessions have shown that combining local and scientific knowledge to generate contextual knowledge is vital for developing farmers' skills, improving management and production; (4) the implementation of sustainable practices, such as the production of biofertilizers and organic compost, demonstrates how novelties can help reduce costs and increase efficiency.

Suggestions for future studies can outline a range of opportunities to deepen knowledge about collaborative agricultural practices and novelties. Longitudinal research that tracks the evolution of farmers' practices and the effectiveness of implemented novelties over time could provide an understanding of their acceptance and legitimacy in other contexts. Investigations comparing the RECA Project's experience with similar initiatives in different regions of Brazil or worldwide could enrich the literature, offering insights into best practices and adaptive approaches in diverse contexts.

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Authorship

Verlaine Alves da Cunha Ribeiro *

Universidade Federal de Rondônia, Programa de Pós Graduação em Administração

Campus José Ribeiro Filho - BR 364, km 9,5 sentido Acre, s/nº, Núcleo de Ciências Sociais Aplicadas (NUCSA) - Bloco 1K CEP 76801-059, Porto Velho, RO, Brazil

E-mail: verlaineribeiro@hotmail.com

https://orcid.org/0000-0002-7243-9747

Dércio Bernardes-de-Souza

Universidade Federal de Rondônia, Programa de Pós Graduação em Administração

Campus José Ribeiro Filho - BR 364, km 9,5 sentido Acre, s/nº, Núcleo de Ciências Sociais Aplicadas (NUCSA) - Bloco 1K CEP 76801-059, Porto Velho, RO, Brazil

E-mail: dercio@unir.br

https://orcid.org/0000-0003-1488-8840

Maria Clarice Alves da Costa

Universidade Federal de Rondônia, Programa de Pós Graduação em Administração

Campus José Ribeiro Filho - BR 364, km 9,5 sentido Acre, s/nº, Núcleo de Ciências Sociais Aplicadas (NUCSA) - Bloco 1K CEP 76801-059, Porto Velho, RO, Brazil

E-mail: mariaclaricecosta@hotmail.com

https://orcid.org/0000-0002-6436-583X

Sabrina Sissy Carvalho Correa Alves

Universidade Federal de Rondônia, Programa de Pós Graduação em Administração

Campus José Ribeiro Filho - BR 364, km 9,5 sentido Acre, s/nº, Núcleo de Ciências Sociais Aplicadas (NUCSA) - Bloco 1K CEP 76801-059, Porto Velho, RO, Brazil

E-mail: sabrinasissy@hotmail.com

https://orcid.org/0009-0001-5386-5943

* Corresponding Author

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Authors' Contributions

1st author: conceptualization (equal), formal analysis (equal), investigation (lead), methodology (equal), writing - original draft (equal).

2nd author: conceptualization (equal), formal analysis (equal), investigation (equal), writing - review & editing (lead), supervision (lead).

3rd author: conceptualization (supporting), formal analysis (supporting), visualization (supporting), writing-review & editing (supporting).

4th author: conceptualization (supporting), formal analysis (supporting), visualization (supporting), writing - review & editing (supporting).

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Data Availability

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