


The use of technology in family farming food production: Evolution and popular knowledge

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ABSTRACT

Ethnoknowledge is a concept related to the knowledge, knowledge and cultural traditions of family farming. In this context, with the emergence of the Green Revolution, there were some obstacles to the development of subsistence agriculture with innovations in technology for food production and commercialization. In emphasis, this research aims to draw conclusions about the role of technology in family farming and its impact on the Brazilian rural economy, based on a synthesis of the results obtained from the literature review. With advances in technology, small producers are experiencing difficulties in the field, which in turn are unable to produce food on a long scale. The effect of the green revolution allowed the intensive use of pesticides, agricultural machinery, genetic improvement of seeds and other purposes that favored advances in technology in agriculture. However, with these advances, the role of agricultural production technology has caused greater complexity in agricultural activities in the field with improvements in quality, quantity, food security, economy and labor. The advancement of technology caused the lack of progress in food production in family farming, with low production and devaluation in the market. In short, it is worth highlighting that the importance of ethnoknowledge for family farmers is based on recovering cultures and traditions of original peoples, emphasizing techniques and instruments that are passed on from generations to generations, such as ancestors that are used in everyday life, experiences and knowledge transmitted. from father to children.

Keywords: Innovation, Ethnoknowledge, Subsistence agriculture.

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INTRODUCTION

Family farming is a type of agriculture in which the landowner and his family are responsible for planting and producing food. What is harvested is used to support the family, while the surplus is often sold to neighbors or at small local markets. According to data from the 2017 Agricultural Census, carried out by IBGE, 77% of Brazilian rural establishments are classified as family farming, totaling around 3.9 million establishments.

Despite the significant presence of areas classified as family farming, responsible for 77% of Brazilian rural establishments, this modality contributes only 23% of all agricultural production in the country, due to its emphasis on traditional practices and the absence of modern technology. However, it is an important source of employment and income in rural areas.

The techniques used in family farming are predominantly based on knowledge transmitted orally over generations, based on community experience and practical learning. According to Mendonça et al., (2013), “the family continues to be the basis for the formation of rural young people, as it is mainly from learning within the family that they consider themselves qualified to carry out agricultural activities”. Although these practices have evolved over time, especially after the Green Revolution that began in the 1960s, the implementation of technological advances is slow, mainly benefiting large producers.

According to Matos (2010), the Green Revolution introduced systematic studies and application of technologies in agricultural production. However, in Brazil, technological advances in agriculture have been more significant in the 20th and 21st centuries, propelling the country to a prominent position in global food production. However, family farming producers face difficulties in keeping up with this pace due to the lack of access to information and technology, as well as limitations in education and financial resources.

The development of agroindustry contributes significantly to the primary sector of the Brazilian economy, reflecting the effective application of technology and industrial organization. However, it contrasts with the slow progress of family producers, highlighting structural and socioeconomic challenges.

Therefore, this study aims to analyze the impact of technology on Brazilian family farming and its implications for the economic and social development of rural areas. To achieve this purpose, a comprehensive literature review will be conducted, exploring the historical evolution of family farming, the effects of the Green Revolution and the role of technology in agricultural production in Brazil.

Subsequently, the main challenges faced by family producers and opportunities for their development will be identified, including incentive policies and technical training. Therefore, the



objective of the research aims to draw conclusions about the role of technology in family farming and its impact on the Brazilian rural economy, based on a synthesis of the results obtained.

METHODOLOGY

The literature review plays a crucial role in conducting scientific research, providing a solid theoretical basis and contextualizing the problem investigated within the existing body of knowledge. According to Vieira (2012, p. 30):

The literature review or bibliographic review is the task of finding elements, through citations, that reinforce the arguments about the elements that will be used to test the hypotheses. In short, they will also contribute to the foundation of the argument.

Within the bibliographic review, it was decided to carry out a narrative review, an approach that involves a descriptive and interpretative analysis of the relevant literature on the research topic. According to Rother (2007), “narrative review articles are broad publications, appropriate for describing and discussing the development or “state of the art” of a given subject, from a theoretical point of view”. Thus, through this approach, the researcher seeks to identify patterns, trends and gaps in existing knowledge, providing a comprehensive and contextualized view of the field of study.

THEORETICAL FRAMEWORK

EVOLUTION OF AGRICULTURE AND FAMILY FARMING

Agriculture is an ancient activity that has enabled the development and construction of cities over the years. In the past, men were considered nomads, that is, they did not live in a fixed place, they basically lived in social groups and constantly changed territories in search of food for the group they were part of. However, according to Arieira (2017, p.20) “the discovery that discarded seeds gave rise, in a later period, to new plants, was the starting point for a unique revolution in the development of society and civilization”.

In this sense, the first civilizations began to emerge close to rivers and other water tributaries, which were suitable places for sowing and harvesting food from the land. It is worth noting that this process was not immediate, but was increased over several generations, year after year, until it reached the level of maturity it currently finds. Over time, a natural selection was made of the best production techniques, the best seeds, which adapt to each type of soil, and the best types of climate for each plant culture.

The development of agriculture was one of the main instruments for the development of humanity, if not the most important. Currently there are several international and national companies that are responsible for a large part of the planet's food supply, however, even in this competitive



market scenario the role of family farming is unquestionable, as its potential goes beyond food production.

Family farming has its own characteristics that distinguish it among various ways of working the land. In addition to its economic and social characteristics, family farming also stands out for the preservation and transmission of traditional knowledge. This knowledge, accumulated over generations, is fundamental for the sustainable management of natural resources and for adaptation to local climate, soil and biodiversity conditions.

Ethnoknowledge arising from experience associated with land management has information that transcends the most diverse techniques used in planting; this cultural wealth acquired through the transport of generations finds, in subsistence, one of the determining factors for choosing this way of life (RIBEIRO, MELO, BARROS, 2016, p. 564).

In this way, the traditional knowledge of family farmers encompasses agricultural, medicinal, culinary and cultural techniques, contributing not only to food production, but also to the conservation of biodiversity and the strengthening of the cultural identity of rural communities.

Family farming in Brazil is divided by Schneider (2014) into three distinct phases. The first phase, between 1990 and 1995, which began after the end of the military dictatorship, saw a resumption of the role of the union movement in promoting and defending the interests of family farmers. This period marks the resurgence of social mobilization in rural areas and the strengthening of the struggle for agrarian reform and the valorization of family farming as a pillar of the national economy.

In the second phase, which runs from 1996, with the advent of the National Program for Strengthening Family Farming (PRONAF), until 2006, there is a growing protagonism of mediators and intellectuals, especially social scientists, in the debate on family farming in the Brazil. Through studies, research and academic publications, these actors gave greater visibility to the need for public policies aimed at the growth and strengthening of family farming in Brazil. As a result, it is possible to mention the creation of the Food Acquisition Program (PAA), in 2004, and the improvement of the National School Meal Program (PNAE).

However, a significant milestone for family farming in Brazil in the second phase was the promulgation of Law 11,326, which became known as the Family Farming Law. This legislation provided several advances for the sector, including the 2006 Agricultural Census, which segmented agricultural establishments into family and non-family establishments, enabling a more detailed and precise knowledge of the characteristics of family units in Brazilian agriculture.

This legislation was extremely important as it brought definitions and concepts that characterize and distinguish family farmers, which subsequently facilitated access to credit and public policies for these farmers. As provided in its art. 3rd,



For the purposes of this Law, a family farmer and rural family entrepreneur is considered to be someone who carries out activities in rural areas, simultaneously meeting the following requirements:

- a) does not hold, in any capacity, an area larger than 4 (four) fiscal modules;
- b) predominantly use the family's own labor in the economic activities of their establishment or enterprise;
- c) have a minimum percentage of family income originating from the economic activities of your establishment;
- d) run your establishment with your family.

The third phase of family farming in Brazil began with the publication of the 2006 Agricultural Census Special Notebook, on September 30, 2009, and has continued to the present day. This event triggered an intense debate about the role of family farming in the country's rural development.

When approaching the different phases of the debate on family farming in Brazil, the complexity and relevance of this topic for the country's rural development becomes evident. The clash between different social actors, such as unions, research institutions and government organizations, reveals the different perspectives and interests involved in the discussion about the future of family farming. In this context, recognizing the role of ethnoknowledge in family farming emerges as a crucial element to understand and value traditional agricultural practices and local knowledge that have supported food production over time.

This idea is defended by Menezes (2019, p. 44), when he says that:

This knowledge combined with social interaction relationships of proximity and kinship makes the social organization of work in rural areas a unique form that brings together individual and collective characteristics simultaneously. The subjectivity contained in the affirmations of belonging and care for the land and others is one of the main characteristics that differentiates the type of economy and social organization of work in the community.

It is important to highlight that family farming cannot be understood solely from an economic or technical perspective. It is essential to recognize the importance of traditional knowledge and cultural practices that are transmitted from generation to generation in rural communities. According to Castro (1997), the knowledge and management methods adopted by traditional communities also play a crucial role in the conservation of biodiversity. Menezes (2019, p. 85) adds that:

In the midst of major global transformations, these populations preserve their history, their religion, their rites, their medicine (healing methods), their own economy of culture and life. They give new meaning to their material and symbolic way of life, even though they are constantly marginalized by the means of development of the dominant economic power.

Thus, ethnoknowledge in family farming not only contributes to the preservation of biodiversity and local ecosystems, but also strengthens the cultural identity and resilience of communities in the face of socioeconomic and environmental challenges.



Therefore, when observing the history of agriculture, especially family farming in Brazil, it is essential to promote policies and practices that value and encourage the sustainable use of ethnoknowledge. This implies not only recognizing the diversity of knowledge and practices that exist in rural communities, but also creating support and protection mechanisms to guarantee the continuity of this knowledge over time. By doing so, we can contribute to strengthening family farming as a model of sustainable and resilient food production, capable of promoting rural development and food security in Brazil.

THE EFFECTS OF THE GREEN REVOLUTION

The Green Revolution emerged in the 1960s and 1970s in the middle of the 20th century, in the construction of parameters, advances and development in agricultural production systems, with an emphasis on the search for improvements in agriculture through the evolution of technology (Matos, 2011). In this sense, it is considered that the Green Revolution is a process that involves agrarian politics and economy that achieved productive intensification through massive uses of mechanization, irrigation systems, intensive use of pesticides and genetic improvements (Martins; Moretto, 2023).

The advancement of the Green Revolution in the world was affected by problems arising from hunger, which led to the perception of low food productivity in some specific countries. However, after the growth of hunger, the “technological package” was adopted with advances in the modernization of agriculture around the world (Munerato et al., 2023). In Brazil, the Green Revolution led to global leadership in the production, exploration and expansion of food. Along with the creation of agricultural credit bodies that allowed farmers and rural producers to pay for agricultural productivity in harvests (Nogueira et al., 2023).

According to Arruda et al., (2023) the Green Revolution provided family farming with a subsistence compared to the way carried out by extensive agriculture, which ensures that small producers do not advance in the job market, making it difficult for family farmers to follow the productivist means- technology in the agricultural field. Amid the expansion of extensive agriculture, the justification evaluates humanity's food and nutritional security.

According to Santana et al., (2023) family farming is a practice inherited from generations to generations from parents to children seeking to prevail the cultural resistance of knowledge of the man of the land. Rural farmers normalize and advocate the concepts of sustainable agriculture and biodiverse agroecosystems, raising the methodological foundation of agroecological parameters.

With these advances of the Green Revolution in the face of technology in agriculture 4.0, it provides progressions related to aspects of improving field production in the use of inputs, machinery, seeds with genetic improvement, greater precision, lower productivity costs and shorter



time of hand availability of work. However, the increase in extensive agriculture has advantages and disadvantages when related to environmental impacts (Dias et al., 2023).

In this regard, the modernization of agriculture related to the Green Revolution demonstrates some disadvantages in terms of purposes and the environment. Because, producers who do not use these technological standards become disproportionate to those who do not use technological advances. Above all, in addition to the lack of standardization in the countryside and in rural areas, the indiscriminate use of pesticides, revolutionized by the Green Revolution in a paradigm with agricultural machinery for spraying such as: drones, aerial application and grasshoppers (Campanhola et al., 2022).

THE ROLE OF TECHNOLOGY IN AGRICULTURAL PRODUCTION

The expansion of technology in agricultural production was developed from the growing demand for food. Being a key factor in ensuring improvements in quantity and quality in food production (Lesão et al., 2021). On the other hand, the development of technology in agricultural production intensified the management of complexity in field activities with factors related to the conditions between innovation, agriculture and territory, favoring qualified labor for rural producers (Mesquita, 2022).

Given this scenario, the Brazilian agribusiness sector suffers from advances in new technologies, facing major challenges and critical issues which, in turn, are related to land expansion, deforestation and greenhouse gas emissions that involve the management of agriculture. 4.0 (Quintam; Assunção. 2023). Amid challenges, technology is also seen as crucial for innovative solutions that reinforce the importance of agricultural production (Portal et al., 2023).

Sausen et al., (2021) argues that the use of technology for food production should be adopted by rural producers. With this technology, it can be seen that monitoring sensors and artificial intelligence offer guarantees in the development of agricultural food production. Above all, agriculture 4.0 brings essential tools and techniques for production, generation and quality assurance in food productivity.

Goffi et al., (2017) discussed that the use of technologies in soybean production makes an increase in production evident, generating the viability of growth in new production areas and consequently, providing an increase in cultivated areas. With these field technologies, studies and research have shown an increase in the Brazilian economy in recent years with the generation of income and jobs in the field.

The evolution of technology in agricultural production encompasses advanced aspects in relation to food security. Previously, the literature states that there were quantitative and qualitative losses in the reduction and quality of food. In this sense, advanced technologies provide innovative



packaging, refrigerated transport and the use of storage systems that minimize the loss of food quality (Pimentel et al., 2024).

In accordance with the evolution of technologies in general, there will always be advantages and disadvantages when it comes to innovations. Therefore, technological advancement in areas of agricultural production must follow some concepts and processes such as: knowledge of production, decisions, forms of implementation and consider ways in which technology can benefit productivity, labor, cost, in the economy and the job market (Santos et al., 2024).

CONCLUSION

Ethnoknowledge is one of the fundamental pillars for the evolution of techniques used today by rural producers within family farming. When working in the field, methods, techniques and instruments that are cultural to a people are used. Popular knowledge can be understood as the transfer of ancestral knowledge that is used daily in the way of living and working, in coexistence and in kinship ties. This way, younger people carefully observe and follow the stages of work, allowing the technique to be passed on from generation to generation.

The use of techniques arising from popular knowledge prevails over technology when comparing their insertion in the production of these properties. However, this fact does not eliminate the use of innovation mechanisms by these communities. It appears that studies have shown that family farming has low rates of use of the main technologies, with significant regional heterogeneity regarding the use of certain practices and inputs. Therefore, the factors that hinder technological advancement in subsistence agriculture include the scarcity of financial resources, lack of technical assistance, insufficient credit policies and the small space of properties, which prevents the increase in production and the obtaining of a considerable profit to be reinvested in the development of the activity.



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