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Family farming and adequate and healthy diet intertwined in the brazilian semiarid region: meanings and practices

Agricultura familiar e alimentação adequada e saudável entrelaçadas no semiárido brasileiro: significados e práticas

Agricultura familiar y alimentación adecuada y saludable entrelazadas en el semiárido brasileño: significados y prácticas

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ABSTRACT

Family farming has been emphasized as a crucial strategy for fostering an adequate and healthy diet. This study employed a two-pronged data collection approach to analyze the agricultural and eating practices of family farmers in the semiarid region of Bahia, Brazil: (1) qualitative data gathered through focus group discussions with family farmers participating in a Technical Assistance and Rural Extension project; and (2) ethnographic research conducted with two farming families in the same region. The analysis reveals that contemporary family farmers are integrated into the dominant, industrial, globalized agrifood system, as they also utilize commercially produced crops and other products not typically associated with family farming. Nonetheless, they can still produce foodstuffs based on agroecological principles, employing strategies such as the agroforestry garden and by growing organic crops. This demonstrates the complex interplay between family farming, agroecology, and the broader food system, challenging the idealized notion of family farming as separate from and opposed to the dominant agrifood model. Such a scenario opposes the institutional and academic narratives relating family farming and a healthy and adequate diet, and it is questionable how this proposed idealistic perspective is achievable.

Keywords: Food and Nutrition Security, Human Right to Adequate Food, Family Farming, Healthy Diet

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RESUMO

A produção de alimentos pela agricultura familiar é destacada como uma estratégia para promover uma alimentação adequada e saudável. Analisa-se práticas agroalimentares de agricultores familiares do semiárido da Bahia, Brasil. Foram utilizadas duas estratégias para produção de dados: (1) narrativas produzidas por nove grupos focais realizados com agricultores de um Projeto de Assistência Técnica e Extensão Rural; (2) trabalho etnográfico realizado em uma das comunidades deste projeto, onde agricultores também participaram dos grupos focais. Analisa-se que as famílias agricultoras contemporâneas estão conectadas ao sistema agroalimentar hegemônico, industrial e globalizado ao consumir cultivos comerciais e outros produtos de origem não familiar. Porém, eles também produzem alimentos pautados em princípios agroecológicos, com estratégias como o quintal agroflorestal e a produção de orgânicos. As práticas agroalimentares mostram que os mais diversos modelos de produção e sistemas alimentares estão emaranhados. Esse cenário distancia esses produtores da relação com a promoção da alimentação adequada e saudável e questiona-se como esse ideal, como proposto institucionalmente, é possível de ser alcançado ou promovido.

Palavras-chave: Segurança Alimentar e Nutricional, Direito Humano à Alimentação Adequada, Agricultura Familiar, Alimentação Saudável

RESUMEN

Se destaca la producción de alimentos a través de la agricultura familiar como una estrategia para promover una alimentación adecuada y saludable. Se analizan las prácticas agroalimentarias de agricultores familiares de la región semiárida de Bahía, Brasil. Se utilizaron dos estrategias para la producción de datos: (1) narrativas producidas por nueve grupos focales realizados con agricultores de un Proyecto de Asistencia Técnica y Extensión Rural; (2) trabajo etnográfico realizado en una de las comunidades de este proyecto, donde los agricultores también participaron en los grupos focales. Se analiza que las familias campesinas contemporáneas están conectadas al sistema agroalimentario hegemónico, industrial y globalizado mediante el consumo de cultivos comerciales y otros productos de origen no familiar. Sin embargo, también producen alimentos basados en principios agroecológicos, con estrategias como la agrosilvicultura de traspatio y la producción orgánica. Las prácticas agroalimentarias muestran que los más diversos modelos de producción y sistemas alimentarios están entrelazados. Este escenario aleja a estos productores de la relación con la promoción de una alimentación adecuada y saludable y cuestiona cómo es posible alcanzar o promover este ideal, tal como lo proponen institucionalmente.

Palabras clave: Seguridad Alimentaria y Nutricional, Derecho Humano a una Alimentación Adecuada, Agricultura Familiar, Alimentación Saludable

Introduction

The current hegemonic, industrial and globalised agrifood system has undergone critical evaluations due to its negative impacts on human health and the environment. Based on this, a certain institutional narrative points to the strengthening of family farming as a relevant strategy for fostering an adequate and

healthy diet (FAHD). This approach envisages production models with low environmental impact by a given social group, including them into the paradigm of sustainable food production and opposing them to the model characterised by the use of agrichemicals and Genetically Modified Organisms (GMO).

Family Farming is characterized as being composed of small landowners who work the land employing the labour of their own family members, producing both for their own consumption and for sale, living in small communities or rural settlements[1]. In Brazil, the term reaches greater social, political, and academic legitimacy with the approval of Bill 11.326[2], regulated by the decree 9.064[3].

When it comes to an adequate and healthy diet, beyond the mere focus on the role of the nutritional aspect of food, this current notion deals with the understanding of a fundamental human right and with the sociocultural and affective issues of eating, as well as the environmental sustainability of food production based on models rooted in agroecological principles and on food sovereignty[4].

According to Dietary Guidelines for Brazilian Population, an adequate and healthy diet arises from a socially and environmentally sustainable food system and should be based on adequate and sustainable production practices[5]. This system is characterized by the strengthening of family agriculture, which is considered the “strongest link to support the modes of production, access, and consumption of healthy food”[6] (p.1114).

Family farming is thus considered able to improve the nutritional quality of diets and as minimizing the double burden of malnutrition (undernutrition and obesity in the same population). It works through the production of food that is to be transported for a short distance and that will be employed in natura in the preparation of meals, as opposed to the production model that is geared towards the provision of industrial, ultra-processed foodstuffs[7,11].

This production system, characterized by its low environmental impact and connection to agroecology, is associated with the sustainable use of natural resources, the protection of agrobiodiversity, and the creation of employment and income opportunities in rural areas. Consequently, family farmers are no longer viewed as an obstacle to agricultural development but are increasingly recognized for

their vital role in achieving food and nutrition security (FNS) at both regional and global levels[7,8,9,1011].

Additionally, it might be relevant to note that in Brazil, the National School Feeding Program (NSFP) fosters access to healthy food for public school students, thus contributing to strengthening family farming by purchasing their production[12,13,14,15,16].

This paper analyzes agricultural and eating practices of family farmers in the semiarid of Bahia – Brazil. By examining these practices, the text explores the scope, possibilities, and tensions inherent in the relationship between family farming and the FAHD in the institutional and academic context. This research is particularly interested in understanding the factors contributing to continuity, change, and transitions in the agricultural and eating practices of family farmers.

The study of agricultural and eating practices of farming families in the semiarid of Bahia paints a picture of family farming in the second decade of the 21st century, following a set of public policies focused on promoting FNS across the country. It shows that while these families are entangled with the hegemonic, industrial, globalized agrifood system, they can also carry out behaviors proper to the agroecological transition. The publication of research regarding contemporary family farming remains particularly relevant as it can characterize the transition processes that occur from the understanding of such practices, potentially contributing to decision-making and the interpretation of global environmental change.

Theory

To address the complexities inherent in this research, we draw upon actor-network theory (ANT) as a theoretical framework, based on the work of Bruno Latour[17]. According to it, one must consider controversies regarding who or what is acting whenever any individual takes action. In the term actor-network, the actor, rather than being considered as the source of an act, should be considered as the “moving target of a broad set of entities that swarm in its direction”. According to Latour, the meaning of the word “actor” is unclear with regards to who or what acts whenever anyone takes action, considering that at any given point no individual acts

entirely by themselves. Therefore, when defining the actor as a network-actor Latour represents the source of the uncertainty regarding the origin of the action[17] (p.75).

Direct interactions are liable to interferences from various sources of action, which explains that whatever actions taken at any given point of a process derive from distant origins from several other places and times, as well as from remote actors. The ingredients of no interaction pertain to neither a single time nor to one single place. The material quality of those in charge of directing an action also varies along every pathway. Therefore, any action should be understood as a concatenation of mediators. It does not belong to a specific place and is affected by heterogeneous entities, which do not have the same local presence and do not originate at the same time. Therefore, there is an entanglement of connections (network of links) that leads the actor to action[17].

Methodology

The Brazilian semiarid region comprises 18.2% of the country's landmass. This region encompasses two distinct biomes: the *Caatinga* and the *Cerrado*. Both are characterized by irregular rainfall patterns, with most precipitation concentrated in a few months, and high evaporation rates[18,19]. This study focuses specifically on the *Caatinga*, a biome unique to Brazil, that holds significant global importance for biodiversity. Approximately one-third of its plant species and 15% of its animal species are endemic, found nowhere else on Earth18.

This article draws on data from two primary sources: (1) qualitative data gathered through nine focus group discussions conducted in 2011-12 with 97 family farmers (primarily adult women) participating in a Technical Assistance and Rural Extension (TARE) project in the Sisal micro-region. These discussions were complemented by observations made during household visits and technical advisory sessions with food production groups. (2) Ethnographic research conducted in 2015 with two farming families in the same region. One family farmed near the Itapicuru River, while the other resided further from the river and employed specific strategies to cope with water scarcity.

Focus groups were conducted with participants who had attended food and nutrition education workshops held in 19 communities. This strategy aimed to

evaluate such activities, as well as to investigate the circumstances connected to the history of food in this region.

The ethnographic component of the research involved seven adult family farmers, one teenager, and two children. The primary goal was to observe and understand the practices related to food production, distribution, marketing, acquisition, preparation, and consumption. The selection of participating families was based on the following criteria: (1) trust relationship established with family farmers, (2) their availability to participate in the study, (3) family income originated from the livestock and agricultural crops they developed, and (4) the different types of agricultural and eating practices. It is worth mentioning that the farming families included in the ethnography also participated in the focus groups of the TARE project.

All participants provided informed consent, and their anonymity has been preserved throughout the study.

The analysis focuses on specific food items or food groups (maize, cassava, beans, animal source foods, fruits, and vegetables) as analytical units, rather than processes of production, distribution, marketing, acquisition, preparation, or consumption. This categorization allowed for detailing particular issues regarding each practice and was influenced by studies in the field of Food & Culture that aim to broaden the view which focuses predominantly on the nutritional aspect of food and thus adopting an investigation based on dish, food and meal. By examining these practices, we explore the scope, possibilities, tensions, and contradictions inherent in the relationship between family farming and the fostering of adequate and healthy diet within the institutional and academic context.

Results and discussion

The cultivation of maize and the controversies around genetic improvement

Maize is a staple food in the region, consumed daily in the form of couscous. Families typically purchase couscous flour from small local markets. A survey of the

two largest markets in the village revealed that all ten brands of couscous flour available contained genetically modified maize.

Traditionally, maize couscous was originally prepared using a wooden pestle and later with mechanical grinders. However, commercially produced couscous flour has been available in the region since the 1980s-90s, as revealed in interviews with local farmers. Maize planting typically occurs in April and harvested in June, coinciding with the St. John's festivities. During this period, maize-based dishes feature prominently in celebratory meals, highlighting the cultural significance of this ingredient.

With the exception of seeds identified as Creole varieties, the seeds cultivated by these farmers for commercial purposes are provided by governmental agencies, such as the former Bahian Agricultural Development Corporation (BADC) and the Brazilian Agricultural Research Corporation (BARC). One example is the BRS *catingueiro* seed, a variety of early-maturing maize introduced in 2005. This variety is known for its drought tolerance, making it well-suited to the semiarid conditions of the region[20].

The integration of technological innovations, including genetically engineered crops like the BRS *catingueiro* maize, is evident in the contemporary agricultural and eating practices of family farmers in the semiarid region. The presence of GMOs is confirmed by labels on maize-based products (couscous flour, porridges, popcorn, etc.) and animal feed sold and used locally. Notably, the consumption of these products appears unaffected by the inclusion of the GMO labeling.

This study found that family farmers purchase and rely on products from agribusiness to support their agricultural activities. In previous generations, particularly during the 20th century, family farmers in the semiarid region were largely self-sufficient, producing most of their own food. However, recent decades have witnessed significant economic and political shifts that have strengthened Brazilian agribusiness. These changes, coupled with climate change impacts, have profoundly altered the livelihoods of family farmers. As new food products, tools, and technologies become available, farmers are adapting by acquiring new skills.

The findings reveal a complex interplay between family farming and agribusiness. Considering the agricultural and eating practices regarding maize,

contemporary family farming does not seem to correspond to the idealised image by which each model is shown as being in stark opposition to the other, more associated with technological innovations stemming from modern agricultural science. Crops from family farming are highlighted as belonging to a productive system of low environmental impact, since it avoids the impact caused by the large areas where monocultures are cultivated (GMO or otherwise) and with the use of agrichemicals. It is through this very misconception that maize grown and sold by the family farmer gains the status of “adequate and healthy”. However, we emphasise that other dimensions must be considered, for example the issue regarding the genetic improvement of seeds.

The globalization process has played a key role in shaping the distinctions between various seed categories, such as traditional, Creole, conventional, and local. These classifications have emerged in contrast to the modernization and industrialization of agriculture, reflecting a growing awareness of the value of preserving traditional agricultural knowledge and practices.

During fieldwork we discussed whether the seeds provided to farmers by the institutional actors would be “closer” or “more distant” from what is conceived as “adequate and healthy”. Thus, the question arises: if family farmers adopt the innovations coming from new varieties of maize, and not only seek the conservation of traditional seed varieties, would they still be acting in the FAHD? It is noted here that the notion of an adequate and healthy diet refers to adequate and sustainable production practices[21].

GMOs have been studied, produced and consumed by the population in Brazil since the 1990s, although the legalisation of their production and commercialisation only took place in 2005. The most commonly recognised food products resulting from such biotechnology are soy and maize; however, research with a number of other species has been carried out. In Brazil, attention must be drawn to the lack of risk assessment studies and the unexpected nature of the approval of its commercialization[22,23].

Cassava cultivation and drought issues

Drought poses a significant challenge to agriculture in the semiarid regions, affecting all crops. Prolonged drought periods, coupled with political, economic, and cultural factors, have led to a substantial decline in local cassava production. This decline has distanced family farmers from their traditional food source and disrupted their ability to market cassava and its derivatives, a practice common in previous generations. Despite this shift, the consumption of cassava root, flour, and *beiju* remains deeply ingrained in the local culture, particularly the daily practice of consuming cassava flour with beans as a staple lunch meal.

Historically, after the cassava harvest, families would bring their roots to communal "flour houses" for processing. These flour houses were rudimentary mills equipped with specialized tools and techniques for processing the cassava into flour. While the village once had numerous flour houses, today only a few remain, including one modernized with electrical equipment in the early 1990s through a government initiative.

The decline in flour houses reflects the broader reduction in local cassava cultivation. As cassava production dwindled, farmers increasingly relied on purchasing cassava flour and other processed products from local markets. This shift coincided with the adoption of new agricultural and culinary techniques, demonstrating the farmers' adaptability to changing circumstances.

Progressively, these families have started to prepare and consume new varieties of foods, such as breads, cakes, cookies, fruit pulp, and yogurt, which began to be marketed by governmental food programs involving mainly female family farmers. Furthermore, rural electrification programs have enabled the adoption of modern kitchen appliances such as blenders and freezers, further transforming food preparation and storage practices.

While water scarcity has undoubtedly contributed to the decline in traditional food production, the adoption of new skills and access to novel products and technologies have also played a significant role in this shift. Consequently, many family farmers in the semiarid region now rely on ingredients sourced from agribusiness to complement their diets. Baked goods, for example, often utilize

ingredients like white wheat flour, transgenic maize starch, margarine, and sugar, mirroring the trends seen in urban areas.

It is important to recognize that these newly acquired skills contribute to income generation for rural families. Baked goods and yogurt production, for instance, exemplify how farmers are diversifying their income streams by adopting new skills and producing goods that were not traditionally part of their livelihood. While these techniques have a long history globally, the use of industrialized ingredients in their production can be seen as a departure from the idealized vision of family farming and its connection to FAHD.

Bean cultivation and agrobiodiversity issues

The region boasts a diverse array of bean varieties, though this diversity has diminished in recent years as farmers have increasingly focused on cultivating *carioquinha* beans (*Pinto* beans) for commercial purposes. This trend illustrates the challenges to maintaining agrobiodiversity when market forces favor specific varieties.

To understand the dynamics at play, we will examine the characteristics of Creole or traditional seeds and their connection to agrobiodiversity. Family farming plays a vital role in conserving these traditional varieties, as emphasized by the National Council for Food and Nutritional Security[24]. Agrobiodiversity is a crucial factor in analyzing the relationship between family farming and FAHD.

Agrobiodiversity is considered a part of biodiversity and can be categorised on three levels: species diversity (e.g., maize, rice, pumpkin, etc.), genetic diversity (e.g., maize varieties, bean varieties, etc.), and ecological diversity (different types of agricultural systems and ecosystems). It "reflects the dynamics and complex relationships between human societies, cultivated plants, and the environments in which they live" and includes several interactive elements relevant to agriculture: the spaces utilized, the species managed directly or indirectly, and the genetic diversity between the same species or several species[25] (p.91).

The sustainability of different agricultural production models may be threatened by the loss of biodiversity. The genetic manipulation of certain organisms, for example, is fundamental to plant breeding, granting agribusiness access to

certain characteristics, such as disease resistance and productivity. In this sense, the conservation of agrobiodiversity by farmers is one of the key components of agricultural models that are “more sustainable and stable in the long term”; such models have been actively encouraged by civil society organisations and agroecological initiatives[25] (p. 89).

Traditional or Creole seeds are part of agrobiodiversity and thus differ from crops considered commercial or of a more narrow genetic basis. The strong emphasis given to agrobiodiversity issues emerges from the widespread reach of globalised monocultures and their impact. The emergence of modern technology, capable of transforming the trade and production of seeds, has turned our attention towards what is understood as “traditional and local”, such as Creole seeds originated through ancient reproductive techniques.

While commercial cultivars may ultimately derive from diverse genetic resources, their development often involves selecting for specific traits, leading to a narrower genetic base compared to the diversity found in traditional varieties. This distinction becomes apparent when comparing monoculture and polyculture farming systems. Monocultures, which dominate industrial agriculture, involve cultivating a single crop over vast areas, reducing genetic diversity. In contrast, polyculture systems, often employed by family farmers, promote biodiversity by cultivating multiple crops in the same area.

The boundaries between "modern" and "local" varieties can be blurry, as modern cultivars often build upon the genetic foundation of traditional varieties. Family farmers, in practice, often employ a mix of both, incorporating seeds of diverse origins into their agricultural systems.

The replacement of local varieties with commercial crops poses a significant threat to agrobiodiversity. Family farmers and traditional communities play a crucial role in conserving these local varieties, which are often adapted to specific environmental conditions and cultural practices. However, the economic pressures of modern agriculture can incentivize the use of commercial seeds, even though they may contribute to the undermining of agrobiodiversity. Family farmers, therefore, navigate a complex landscape, balancing the preservation of traditional knowledge with the economic benefits of modern agricultural practices.

The relationship between ecosystems, communities, and agrobiodiversity is dynamic and constantly evolving. While past generations of family farmers operated within a production model entirely distinct from agribusiness, the current landscape reveals a significant overlap between the two. Contemporary family farming often incorporates commercial seeds, and agribusiness, correspondingly, recognizes the importance of agrobiodiversity for developing resilient and adaptable crops.

These observations raise a critical question: Is the achievement of FAHD solely dependent on the use of agrobiodiverse products by family farmers, or can it also be fostered through the utilization of commercial cultivars?

The access to and use of modern commercial cultivars by family farmers can be understood as being part of the technological circulation and exchanges that, for many centuries, have taken place between humans. However, this does not exempt these producers from the consequences of the technological modernisation of capitalism; as an example, the host of issues springing from problems related to environmental sustainability.

Finally, it should be also noted that the biodiversity conservation initiative is strongly linked to the agroecology paradigm, recognised as the science that “applies the principles of ecology in the design and management of sustainable agroecosystems, and in which scientific knowledge and practices coalesce around a new theory of production”[26] (p.252), a theme that will be addressed in the next section.

The production and consumption of animal-based foodstuffs and the issues of agroecology

Our research provided insights into the agricultural and eating practices of family farmers in the Caatinga biome. Through the lens of agroecology, we examined the scope and challenges of such practices within this unique ecosystem. Agroecosystems, defined as the agricultural activities within specific ecological contexts, represent a key level of analysis in agroecology. The diversity of agroecosystems, interacting with natural ecosystems, constitutes the broader food system.

The creation of the agroforestry gardens stands out; a recently incorporated production model that guarantees the sustainability of animal feed and consequently the sustenance of the family throughout periods of drought. This is a model that, in addition to the economic benefit, brings environmental and health benefits, such as strengthening biodiversity, improving soil quality, and providing food for the families while avoiding the use of chemical-synthetic inputs. Interestingly, the fact that the garden is also composed of “non-native” species, although adapted to the semiarid climate, demonstrates the dynamism in the incorporation of new elements to such ecosystems. It is also worth mentioning that the incorporation of agroforestry as a production system is a form of restructuring such an agroecosystem.

The agroforestry garden examined in this study, established with support from the BADC, the state government, and BARC, features a diverse range of cultivated plants, including non-native forage species, as well as grasses and legumes for animal consumption. While primarily intended for sustainable animal feed production, the garden also incorporates edible plants for human consumption.

Ensuring adequate animal feed during drought periods poses a significant challenge for family farmers. Strategies such as silage and hay making are crucial for maintaining livestock during these dry spells.

Despite the emphasis on agroecological principles, some practices observed in the study deviate from these ideals. The use of industrialized animal feed, including soybean and GM maize, raises questions about the alignment of these practices with the goals of FAHD. Specifically, does the practice of raising fish and chickens on industrialized feed, potentially containing GMOs, contradict the principles of sustainable and healthy food production associated with family farming?

The use of aquaculture, specifically fish farming in clay tanks or small reservoirs, raises questions about its compatibility with agroecological principles. While it can be seen as a strategy for adapting to the semiarid climate and diversifying livelihoods, the reliance on industrialized feed, potentially containing GMOs, presents a clear contradiction. This highlights the ongoing negotiation between traditional practices, innovation, and the influence of the dominant agrifood system.

To sum up, a sustainable food system will only be achieved through a deep change in the nature of human civilization. In this proposed new system, the supply will originate less from global sources/markets and more from local agroecosystems. However, this perspective goes against the current status of globalisation, a movement strongly consolidated in contemporary times and a decision-making imperative of unequivocal economical and political relevance worldwide[27]. The challenges in access to rural credit by the family farmers is yet another element to be taken into consideration.

Therefore, we observe that even though family farmers are immersed in the hegemonic, industrial, globalised agrifood system, they also develop many alternative practices to circumvent it.

The production and consumption of fruits and vegetables, and the issue of agrochemicals vs. Organics

This section examines the production and consumption of fruits and vegetables, which are widely recognized as essential components of a healthy diet. However, the category of "fruits and vegetables" encompasses a vast and diverse array of foods, making it challenging to be analyzed as a single entity.

The family farmer is identified as the agent capable of producing this type of food through an ecological and therefore sustainable production model, based on agroecological principles. Consequently, their work is considered relevant to the promotion of health and FAHD. This relevance is highlighted by the provision of “adequate and healthy” food, a notion which also includes caring for environmental aspects. It is worth remembering that health is a broad concept, comprising many social determinants.

The complex nature of diet-related chronic conditions, namely obesity, hypertension, and diabetes, requires the implementation of measures that “increases the population's access to healthy foods, such as fruits and vegetables, and discourages the consumption of highly processed foods”[28] (p.69). In this sense, the promotion of fruit and vegetable production by family farming is recommended as a relevant action to stimulate the consumption of such foods, in a safe and sustainable way[29].

While fruits and vegetables may not be the primary source of income for family farmers in the semiarid region, they play a vital role in household FNS. When farmers have secure market access and fair prices, often facilitated through institutional contracts or governmental support, fruit and vegetable production becomes economically viable, which reduces their reliance on external food sources.

The use of agrochemicals ("poisons" or "medicines") in food production emerged as a recurring theme in discussions with family farmers. Many farmers recalled a time when agricultural production was free from synthetic inputs and the food consumed was considered "organic" or "natural." This highlights the perceived link between changes in food production practices and community health.

Family farmers have long associated health problems in their communities with the use of agrochemicals, the increased consumption of ultra-processed foods, and the challenges of growing fresh produce due to drought. They expressed concerns about the "contamination" of their food, a phenomenon they perceived as absent in previous generations.

It should be noted that vegetables such as carrots, chayot, potatoes, and savoy cabbage, as well as products such as rice, wheat flour, pasta, bread, biscuits, cakes, muffins, vegetable oil, tomato paste, sardines, sausage, milk powder, condensed milk, heavy cream, grated coconut, margarine, porridge, artificial colouring, etc. have been added to the diet of those families in the last few decades.

Fruits and vegetables belong in the category called in natura or minimally processed foods. These foods “are the basis for a nutritionally balanced, tasty, culturally appropriate diet, which promotes a socially and environmentally sustainable food system”[5] (p.26-29). These hold the potential to contribute to the reduction of the environmental impacts from the production and distribution of food, and to foster “supportive ways of living and producing”[5] (p.31).

It is also emphasised that a greater demand for organic and agroecological-based foods would strengthen family agroecology producers and, consequently, contribute to the materialisation of a socially and environmentally sustainable food system5. It is worth mentioning that Brazilians typically consume relatively small amounts of fruits and vegetables, in quantities lower than those recommended by the World Health Organisation (WHO). In addition, this food group, as well as the quality

of the water sources of the population, is at risk of direct and frequent contamination by the use of agrochemicals in their own crops[26].

This study observed a shift in perspective among some family farmers, driven by knowledge sharing and experiences that promoted a transition from conventional agricultural practices to agroecological approaches. These farmers eliminated the use of agrochemicals and adopted organic production methods, particularly after participating in training programs on organic agriculture introduced in the early 21st century.

The growing interest in agroecology reflects a broader societal shift towards sustainability and social justice in the food system. However, implementing and maintaining agroecological practices can be challenging, as they must be economically viable to protect the livelihood of family farmers. This study observed that farmers often need to engage in diverse income-generating activities to support their families.

Based on this discussion, it is worth mentioning that the agroecological transition, as well as organic and agroecological based production, must be supported by programs and initiatives "that contribute to sustainable development and enable the improvement of the population's quality of life, through the supply and consumption of healthy food and the sustainable use of natural resources"[30] (p.83). The agroecological transition has been linked to healthy food production, income generation, and sustainable management of natural resources. This transition should be carried out through the preservation of traditional practices and knowledge, the reduction in the use of agrichemicals, and the creation of conditions that make organic and agroecological production economically viable for family farmers[7].

Conclusions

The agricultural and eating practices of past generations of family farmers in Brazil occurred in a context prior to the popularization of agrichemicals, GMOs, and industrialised foods in the Brazilian diet. Therefore, "traditional local foods" were produced without agrichemicals, GMOs, or food additives. It is based on this perspective that a certain public narrative about family farming has been established, reproducing an imaginary notion by which family farming would be in opposition to

the various types of technological innovation springing from modern agricultural science. This supports the view of strengthening family farming to achieve the FAHD, since its production models would not negatively impact human health or the environment.

The concepts of sustainability, an adequate and healthy diet, agroecology, organic agriculture and agrobiodiversity, while central to contemporary discussions about food systems, were not explicitly articulated by previous generations of family farmers. Most of these concepts emerged in the latter half of the 20th century, gaining momentum in the 21st century, reflecting a growing awareness of the interconnectedness between human health, environmental sustainability, and social justice.

Despite the idealized image of family farming as entirely separate from agribusiness, their reality is one of increasing integration. Products derived from technological innovations, such as commercial crop varieties and GMOs, are becoming increasingly common in the agricultural and eating practices of family farmers. This adoption of new technologies reflects an ongoing process of adaptation and learning, as farmers acquire new skills and knowledge to navigate the changing agricultural landscape. These shifts in agricultural practices are intertwined with Brazil's broader development trajectory, characterized by modernization and technological advancements in the food system.

The use of commercial cultivars and industrialized, ultra-processed ingredients in food production challenges the idealized image of family farming as exclusively linked to healthy and sustainable diets. While contemporary family farmers are undeniably connected to the dominant industrial agrifood system, they also possess enough agency to reshape their production practices towards more agroecological and sustainable approaches. The transition from conventional models reliant on agrochemicals to those based on agroecological principles, such as agroforestry and organic farming, represents a significant step towards a more just and sustainable food system.

This research reveals the complex and interwoven nature of social practices in the context of family farming. Family farming in the Brazilian semiarid region can be characterized as a hybrid model, drawing upon diverse production methods and knowledge systems from various historical and geographical contexts. This hybridity

reflects the dynamic interplay between tradition, innovation, and the ongoing negotiation between local practices and global forces.

The interconnectedness of diverse production models and agrifood systems raises questions about the feasibility of achieving an idealized vision of FAHD as articulated in institutional narratives. While analytical distinctions can be made between different approaches to food production, the reality on the ground is one of fluidity and complexity. The boundaries between family farming and agribusiness, tradition and innovation, are constantly being negotiated and redefined in the context of social, economic, and environmental change.

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