Fronteiras: Journal of Social, Technological, and Environmental Science
http://periodicos.unievangelica.edu.br/fronteiras/
ISSN 2238-8869

Article

Agroecological Production Unit Promoting Sovereignty, Food Security, and Nutrition in the Municipality of Maricá, Rio de Janeiro, Brazil

Bianca dos Santos Santana[1], Katia Cilene Tabai[2], Fernanda Travassos de Castro[3]

[1] Master's Degree in Sustainable Development Practices. Federal Rural University of Rio de Janeiro. ORCID: 0009-0006-5224-413X. E-mail: biassantana7@gmail.com

[2] PhD in Food and Nutrition. Professor at the Federal Rural University of Rio de Janeiro. ORCID: 0000-0001-6096-5574. E-mail: ktabai@gmail.com

[3] PhD in Food Science and Technology. Faculty member at the Technical College of the Federal Rural University of Rio de Janeiro. ORCID: 0000-0002-6064-6829. E-mail: fertcastro@gmail.com

ABSTRACT

This study analyzed the contributions of the Agroecological Production Units project in Maricá, RJ, to the food and nutritional sovereignty and security of the municipality's residents. The analysis was based on data collected from internal project documents, public notices, and technical reports, as well as questionnaires administered to representatives of the beneficiary social institutions. The evaluated project was carried out under a collaboration agreement between the Maricá City Government and the Cooperative for Advisory Services to Social Enterprises in Agrarian Reform Settlements, with one of its goals being the development of two agroecological production units. Among the data obtained, the production and distribution of 13,795.51 kg of agroecological food stand out, benefiting up to 1,104 people through 11 institutions. The documentary data were collected from February 2020 to December 2022, while the questionnaires were administered between October 22 and 27, 2022. The profile of the beneficiary population revealed that 70% of the institutions served primarily women, 20% had a mixed clientele, and 10% were composed of men. Regarding educational attainment, it was observed that 10% of beneficiaries had not completed elementary school, 30% had completed high school, and 60% had completed elementary school. It is considered that food production at the units contributed to the food security of those served, providing access to 67 types of healthy, sustainable, and diverse foods.
Keywords: urban agriculture; public policies; cooperativism; sustainability.

RESUMO

Esta pesquisa analisou as contribuições do projeto das Unidades de Produção Agroecológica em Maricá, RJ, para a soberania e segurança alimentar e nutricional dos munícipes. A análise foi baseada na coleta de dados por meio de documentos internos do projeto, editais e relatórios técnicos, além da aplicação de questionários aos representantes das instituições de interesse social beneficiadas. O projeto avaliado foi realizado a partir de um contrato via termo de colaboração entre a Prefeitura de Maricá e a Cooperativa de Trabalho em Assessoria a Empresas Sociais de Assentamentos de Reforma Agrária, prevendo, entre suas metas, o desenvolvimento de duas unidades de produção agroecológicas. Entre os dados obtidos, destacam-se a produção e distribuição de 13.795,51 kg de alimentos agroecológicos, beneficiando até 1.104 pessoas por meio de 11 instituições. Os dados documentais foram coletados no período de fevereiro de 2020 a dezembro de 2022, enquanto os questionários foram aplicados entre 22 e 27 de outubro de 2022. O perfil do público beneficiado revelou que 70% das instituições atendiam majoritariamente mulheres, 20% tinham público misto e 10% eram compostas por homens. Em relação à escolaridade, observou-se que 10% dos beneficiados tinham ensino fundamental incompleto, 30% possuíam ensino médio completo e 60% tinham ensino fundamental completo.

Submitted: 08/03/2026 Accepted: 14/04/2026 Publication: 18/06/2026

v.15, n.2, 2026 • p. 1-19. • DOI http://dx.doi.org/10.21664/2238-8869.2026v14i4.8644

Considera-se que a produção dos alimentos nas unidades colaborou para a segurança alimentar dos atendidos, possibilitando o acesso a 67 espécies de alimentos saudáveis, sustentáveis e diversos.
Palavras-chave: agricultura urbana; políticas públicas; cooperativismo; sustentabilidade.

Introduction

In recent decades, Brazil has established itself as a central player in the global food supply, reflecting a process of productive expansion and the export-oriented nature of its agribusiness (Sencébé et al. 2020; Grisa and Porto 2023; Ikematsu and Maurin 2024). Studies analyzing the coexistence of production models—large-scale agribusiness and family/territorial forms of production—document this dual nature of the Brazilian agri-food system: high production capacity for external markets alongside localized and heterogeneous forms of production that remain central to domestic supply (Sencébé et al. 2020; Grisa and Porto 2023). These analyses allow us to position the country as a major supplier in the global trade of agricultural products, without homogenizing the distinct social, territorial, and economic dynamics that underpin it (Ikematsu and Maurin 2024; Sencébé et al. 2020).

The structural transformation of the Brazilian agricultural sector, which intensified in the second half of the 20th century and was deepened by processes of technification and productive concentration beginning in the decades following 1970, expanded productive capacity and directed a significant portion of production toward foreign markets, while simultaneously reconfiguring relations of land, labor, and agricultural specialization (Sencébé et al. 2020; Grisa and Porto 2023; Ikematsu and Maurin 2024). This trajectory explains productivity gains and export integration, but also the contradictions that impose limits on the full exercise of the right to food for segments of the population, since export-oriented growth does not eliminate inequalities in access and quality of domestic consumption (Grisa and Porto 2023; Sencébé et al. 2020).

However, the implementation of the social guarantee of the right to food in Brazil has proven fragile, and in recent years, there have been institutional and operational setbacks that have impacted the formulation and implementation of Food and Nutritional Security (FNS) policies (Recine et al. 2020; Domingos et al. 2023; Silva et al. 2023). Critical analyses of the contemporary period point to changes in governance, the erosion of participatory forums, and the weakening of inter-institutional arrangements as factors that have contributed to the worsening of food vulnerabilities (Recine et al. 2020; Domingos et al. 2023).

The crisis triggered by the COVID-19 pandemic has exacerbated these vulnerabilities: there has been a rise in unemployment, an increase in extreme poverty, and a deterioration in indicators related to food access and quality—impacts identified in academic research and social monitoring reports (J. A. Neves et al. 2021; Little and Sylvester 2022; Domingos et al. 2023). Studies on systemic shocks indicate that large-scale economic events reverberate through production chains and affect household incomes, requiring responses that combine immediate social protection with the strengthening of more resilient local food systems (Little and Sylvester 2022; Dagunga et al. 2023). It is estimated that, due to the COVID-19 pandemic, more than 5.5 million Brazilians were malnourished. Furthermore, one-third of the population, due to low income and lack of access to healthy foods, is believed to be experiencing some form of food insecurity (Gomes Júnior and Belik 2021).

Various sectors are calling attention to the need to address hunger and food insecurity. In 2021, the Brazilian Research Network on Sovereignty, Food, and Nutritional Security (PENSSAN) published the second VIGISAN report on food insecurity among Brazilians, revealing an alarming figure of 125.2 million Brazilians living in a state of food insecurity (FI) and more than 33 million in a situation of severe FI and hunger. This situation is particularly acute in rural areas of the northern and northeastern regions of the country, affecting mainly women, Black people, and those with lower per capita income. Another important aspect to highlight is

the percentage reduction in each type of food: households that stopped buying meat (70.4%), vegetables (63.6%), and fruits (64.0%) were those experiencing the most severe form of FI (PENSSAN 2022).

Despite recent improvements in indicators, food insecurity remains a challenge in Brazil. Data from the Continuous National Household Sample Survey (PNAD Contínua) indicate that, in 2024, approximately 24.2% of Brazilian households experienced some degree of food insecurity, corresponding to roughly one in four households. This percentage represents a decrease compared to 2023, when 27.6% of households were in this condition. Nevertheless, millions of families face difficulties in accessing food regularly and adequately, highlighting the need to strengthen public policies on food and nutritional security (IBGE 2025).

The Organic Law on Food and Nutritional Security (LOSAN), established by Law No. 11,346 of 2006 (Brazil 2006), defines Food and Nutritional Security (FNS) as the guarantee of regular and permanent access to quality food in sufficient quantities, without compromising the fulfillment of other essential needs. This concept also presupposes the adoption of health-promoting, socially just, and sustainable food practices that respect cultural, environmental, economic, and social diversity.

In this context, agroecology and the understanding of production units as agroecosystems—systems that integrate ecological processes, local knowledge, and socioeconomic flows—emerge as potential pathways to enhance resilience, cultivated biodiversity, and the proximity between production and consumption (Dagunga et al. 2023; Dittmer et al. 2023; James et al. 2023). Research highlights that agroecological practices can improve climate adaptation capacities and income stability without compromising production outcomes, while simultaneously promoting the generation of ecosystem services (Dagunga et al. 2023; Dittmer et al. 2023).

The incorporation of public institutional procurement instruments, exemplified by the role of the National School Feeding Program (PNAE), has proven strategic for stimulating local economic flows and connecting agroecological supply to institutional consumption circuits, thereby expanding the potential for food sovereignty and food security (Dias et al. 2020; Bicalho et al. 2021).

Thus, the objective was to analyze and relate the contributions of the results of the project "Maintenance and Expansion of the Agroecological Production Unit in Maricá, RJ" to the promotion of Food and Nutritional Security and Food Sovereignty in the municipality.

Materials and Methods

The study was conducted in the municipality of Maricá, located in the state of Rio de Janeiro, which borders the municipalities of Itaboraí, Saquarema, and Tanguá. In the Human Development Index (HDI) ranking for the state of Rio de Janeiro, Maricá ranks sixth. The municipality has 52 neighborhoods, organized according to its administrative districts. Maricá has a land area of 362.6 km^2 and stands out as one of the cities with the highest population growth in the state. According to the 2022 Demographic Census, the population reached 197,300 inhabitants, representing a 54.87% increase compared to the 2010 Census. The population density is 545.67 inhabitants $per\ km^2$ (IBGE 2024).

Over the past decade, the municipality of Maricá has implemented initiatives aimed at strengthening Food and Nutritional Security (FNS) policies. This includes the implementation of the National Food and Nutritional Security System (SISAN) in the municipality, managed by the Secretariat of Solidarity Economy (Maricá City Hall 2021). The approval of Law No. 2208, dated July 16, 2007, established the Maricá Municipal Council for Food and Nutritional Security (CONSEAN) (Maricá City Hall 2007). And more recently, in 2021, the city's Intersectoral Chamber for Food Sovereignty and Nutrition (CAISAN) was activated, a body that aims to develop a project to ensure healthy food for the population (Maricá City Hall 2021). In addition to programs such as the Basic Citizenship Income and the Mumbuca Social Currency, created in 2013, which has since served as a model for several municipalities in the state. According to the municipality's Secretariat

of Solidarity Economy, in 2021, 42,500 beneficiaries were reached, each receiving R$300.00 (three hundred reais per month), with the municipality investing approximately R$12.7 million monthly (Suplicy and Dallari 2023).

As part of this strategy to ensure the Right to Food, the municipality has also created tools that work together to improve access to food, such as the Prefeito Édio Muniz Dehydrated Food Factory, managed by the Maricá City Government through the Secretariat of Agriculture, Livestock, and Fisheries (SECAPP) (Maricá City Government, 2021). The Mauro Alemão Popular Restaurant, inaugurated in August 2021, offers breakfast and lunch at prices of 1 and 2 reais, respectively, serving up to 1,000 meals daily (Maricá City Hall, 2021). With the visibility of these initiatives, the municipality was recently (2022) invited to join the Milan Pact for Urban Food Policy, the world's most important forum on food security. As a result, Maricá received an international visit from representatives of the delegation of the International Forum of the Milan Pact. This corroborates the municipality's commitment to advancing actions related to Food Sovereignty and Security (Maricá City Hall, 2021). Among these Food Security and Agroecology initiatives, the project that is the subject of this research stands out: Collaboration Agreement 0018, " : Maintenance and Expansion of the Agroecological Production Unit in Maricá, RJ ." This was the first of the agroecology initiatives mapped in the municipality, emerging in 2016 through a contract formulated via a public call for proposals in the form of an agreement with the city government and accessed by the Cooperative.

This research employed a mixed-methods approach, which, according to Oliveira (2020), aims to provide a broader and deeper understanding of the phenomenon under study by leveraging the strengths of both quantitative and qualitative methods. In this way, mixed methodologies allow for the exploration of different facets of the problem under study, which can result in a greater variety of perspectives. Regarding data collection, a survey and descriptive qualitative and quantitative analysis of documents related to the research subject were conducted; data were collected through action research involving immersion and observation of the group's reality, and questionnaires were developed to construct a social profile of the audience reached by the project.

To develop the methodological proposal, other similar studies were consulted to guide the possible paths that would be taken during this research, such as, for example, the study on Intersectorality in the Promotion of Food and Nutrition Security and the Development of Family-Based Agribusiness in Northern Minas Gerais, which utilized qualitative research without statistical data analysis but was grounded in theoretical-empirical knowledge, allowing it to be considered scientific based on literature review, document analysis, and semi-structured interviews (Lima and Tabai 2021).

Quantitative research tools, grounded in action research, were employed. Data collection methods initially involved literature review and document analysis. In the literature review, scientific articles available in electronic libraries, such as *Scielo*, and on search engines, such as *Google* Scholar, were identified and consulted, in addition to books related to the themes of Food and Nutritional Security and Agroecology. In the documentary research, internal project documents—such as forms, technical reports, and public documents like public notices and work plans—were collected and analyzed. These provided detailed information on the operation and structure of the project under study, the quantity and variety of food delivered, and the number of people served. These sources were obtained through searches on official websites and provided by the cooperative implementing the project.

Regarding the ethical aspects of the research, it is important to note that this study is based on the lead author's master's thesis, conducted in the Graduate Program in Sustainable Development Practices at the Federal Rural University of Rio de Janeiro (PPGPDS/UFRRJ). Furthermore, it is a segment of the project

approved by the UFRRJ Committee on Ethics in Research Involving Human Subjects (CEP/UFRRJ) under protocol no. 797/2016.

The second round of data collection was conducted via an online form on the *Google Forms* platform. The questionnaire was designed and made available, yielding 11 responses between October 22 and 27, 2022. The target audience for the research related to this area was managers of institutions benefiting from the delivery of food produced at the agroecological units. These institutions are public or philanthropic in nature, and also include indigenous communities located in the municipality.

It is important to note that the representatives responded based on their perceptions of the majority of those served, since the recipients themselves were not interviewed. The form consisted of 12 questions, aimed at obtaining data regarding the age, gender, and educational level of the majority of beneficiaries, as well as their level of satisfaction with the food received, in addition to information about their participation in the project's training activities.

The questionnaire was distributed via a messaging app, through which a *link* to complete it was sent. The quantitative analyses were descriptive in nature, as no statistical methods were used for data processing. It was possible to analyze the number of people served and the quantity/variety of food delivered by organizing annual spreadsheets, which allowed for visualizing the growth in monthly and annual averages of production volume.

Data obtained through forms—such as gender, age, and education level—were analyzed using percentage averages, which represent the ratio between the number of people who gave each response and the total number of people who answered the question. This allowed for qualitative analyses regarding the degree of satisfaction with the food received, as well as information on participation in the project's training activities, socioeconomic profile, or the degree of vulnerability related to the target population.

Results and Discussion

To better understand the areas of focus identified in the study, it is necessary to understand the project's overall work plan and how the goals and activities associated with each area functioned. The work plan was based on seven general goals related to the project's development: the first goal (Goal 1) related to the administrative structure for product procurement, contracting, resource management, and accountability; the second (Goal 2) involved the development of the work plan, which established the methodological planning for the following year's training sessions; the third (Goal 3) to production in the agroecological units; the fourth (Goal 4) to the implementation of training courses, which could take place in-person or online; the fifth (Goal 5) involved exchanges that served as in-person forums for sharing experiences; the sixth (Goal 6) related to the distribution of food produced at the units; and the seventh (Goal 7) involved the systematization of data and dissemination of the activities carried out.

Goal 3, regarding the maintenance and expansion of agroecological production units, involved a series of processes for maintaining healthy agroecosystems, including: soil preparation, organic fertilization, raising raised beds, planting rows, preparing substrates to provide nutrients and promote soil microbiota diversity, maintaining production systems, implementing crop rotation, intercropping, and producing seeds and seedlings. To track the implementation of this goal, stages were established that function as a monitoring system through eight stages of pl tion. These stages comprised the technical report, which served as an accountability tool regarding the project's development for its oversight bodies. The project's accounts were initially audited by the Secretariat of Agriculture, Livestock, Fisheries, and Supply (SECAPPA) and then forwarded to the municipal project secretariat, which analyzed all investments made through the projects. All stages were described and updated quarterly.

The second research-related goal was Goal 6—focused on food production. This goal is responsible for tracking food from harvest to beneficiaries, developing the harvest calendar and the production distribution calendar.

Agroecological Production Units

The production units developed by the project were public areas designated by the Department of Agriculture, Livestock, Fisheries, and Supply of the municipality of Maricá for the installation of the units. The research enabled us to understand the agroecological production units as agroecosystems, given the complexity of their approaches. The design of agroecosystems, based on agroecological principles, involves promoting biodiversity, fostering self-regulation, and strengthening environmental balance, as well as reducing dependence on external inputs (Canuto 2017) .

On the farms, the variety of food production consisted mainly of species for *fresh* consumption, such as leafy vegetables and fruit vegetables, species known as annuals, including cereals such as corn and beans, roots such as sweet potatoes and cassava, short-cycle fruit crops such as papaya, banana, and watermelon, as well as medicinal plants like rosemary and lemongrass for the preparation of juices, teas, and baths. In addition to the food harvested at the production units, production also includes the production of seeds and seedlings.

The planned agroecological production units were located in public areas designated by the city government. Unit 1, in the Manu Manuela subdivision (Figure 1), covering an area of 0.5 hectares, was first established in 2016 by the cooperative through another mechanism: an agreement with the city government. With the creation of the collaboration agreement in 2020, this unit became part of this new contract. During the same contract transition period, in March 2020, the city government carried out earthwork across the entire area as a solution to recurring flooding issues, thereby raising the elevation of the entire site.

Following the land-leveling work, the unit began the collaboration agreement during the COVID-19 pandemic in early 2020, with the need to be reestablished. In compliance with health recommendations prohibiting in-person activities, installation activities did not begin until June 2020. Following the landfilling, it was necessary to integrate food production with soil restoration, and this was developed by the technical team to implement the soil restoration plan combined with food production.

The Unit covers an area of 2 hectares and is located on the Joaquin Piñeiro Public Farm (Figure 2), in the municipality of Maricá, state of Rio de Janeiro, at the following coordinates: Latitude 22°53'59.90"S and Longitude 42°42'16.97"W. Part of its 2-hectare area is located within the municipal conservation unit Refúgio da Vida Silvestre de Maricá (REVIMAR), consisting mainly of dense ombrophilous forest formations belonging to the Atlantic Forest morphoclimatic domain.

Figure 1. Manu Manuela Agroecological Unit. Source: COOPERAR (2022).

Figure 2. Joaquín Piñero Public Farm Agroecological Unit, Area 2. Source: COOPERAR, (2022)

Since the start of practical activities in June 2020, with the aim of having the production unit represent the diversity of agroecological food production methods and incorporating social technologies adapted to local conditions, production systems were established, including: mandala and raised beds focused on leafy greens, a permanent protection area focused on restoring the riparian forest in the area, an agroforestry system, and an alley system focused on annual crops.

The units' production is highly diverse, focusing on leafy greens such as lettuce, arugula, and kale; fruit vegetables such as eggplant, bell peppers, and tomatoes; and annuals such as corn, beans, and sweet potatoes. In addition to producing ecologically based food, it also serves as an educational facility where various techniques, management practices, and crops are tested to achieve results suited to the region, so th y

knowledge can be shared with local farmers. For this reason, the units also function as visitation and training spaces for schools in the municipality.

Varieties of Agroecological Foods

Based on the information gathered, it was possible to obtain data on the variety of foods produced from the unit's establishment through December 2022, with 67 food species produced, categorized into the groups of vegetables, fruits, grains, roots, medicinal plants, and aromatic herbs. It is important to note that some species have different varieties produced, such as lettuce, for example, where at least four varieties are grown at the units (green curly, purple curly, smooth, and American). Corn, sweet potatoes, and bananas also have more than one variety produced per species.

Access to food diversity aligns with the recommendations of the Dietary Guidelines for the Brazilian population, which advocate that consuming a variety of nutrients protects and maintains the body's proper functioning (Brazil 2014). Therefore, it is possible to attribute production diversity to a diversified food supply, which provides beneficiaries with multiple options for consuming nutritious foods, enabling access to a diverse and healthy diet. Another point relates to access to knowledge about certain species. As conventional markets increasingly limit the diversity of foods consumed by the population, by receiving diverse foods, beneficiaries can be introduced to species they previously did not know because they were not available in the conventional market or because they were not affordable for all income levels.

In addition to the variety, another important result was the volume of food produced and delivered to beneficiaries. Table 1 shows a total volume of 13,795.512 kg for 2020, 2021, and 2022, with annual totals of 700.71 kg, 5,823.42 kg, and 7,271.38 kg, respectively, demonstrating a gradual annual increase.

Table 1. Annual total of food harvested in agroecological units and monthly averages, Maricá-RJ, 2022.

Year	Total	Monthly averages
2020	700.71	233.57
2021	5,823.42	485.28
2022	7,271.382	605.94
Total		13,795.512

Source: COOPERAR technical reports (2022).

Distribution of Agroecological Foods

These foods were made available to institutions. Considering that at least six institutions distributed the foods through "green baskets" shared with families (comprising an average of four members), it was estimated that the foods were delivered to 276 of the people served, totaling approximately 1,104 people. The remaining 163 people benefited from meals prepared at care institutions, such as nursing homes and shelters.

The food was intended for people in vulnerable situations, as one of the strategies to ensure Food Security and Sovereignty, making it possible for this population to access agroecological food through a municipal subsidy. Additionally, it promotes short food supply chains, in which all production from the units is made available for consumption by residents, facilitating access to these foods through public policies.

The beneficiary institutions had different ways of offering the distributed food to those served. In daycare centers, nursing homes, and shelters, the food is prepared and served as a meal. Other institutions receive "green baskets" consisting of *kits* containing a portion of each *fresh* food item.

Regarding the priority criteria for distributing the harvested food, the vulnerability of the selected locations, the volume of food production, and access to other sources of aid were taken into account. Thus, the indigenous villages within the Maricá territory, philanthropic organizations, and shelters were included.

The institutions served emerge in response to the demands resulting from the absence of effective public social policies. With the frequent establishment and dismantling of specific public policies on food security and nutrition (FSN) and family farming in Brazil, a history of policy dismantling is evident. Considering the complex set of actions that underpin these dismantlings in social policies, it is clear that this process has directly impacted FSN policies in the country, contributing to the worsening of food insecurity. The precariousness of these mechanisms is the result of broader institutional changes, whose determinants involve multiple scales; even more so in the context of the recent pandemic, with the application of absences and ongoing processes of social exclusion, studies are needed that highlight the importance of sustainable development. (Gomíde et al. 2023).

The context of social vulnerability faced by the beneficiaries of the agroecological production unit reflects the broader scenario of Food and Nutritional Insecurity (FNI) in the state of Rio de Janeiro and in Brazil, which has intensified in recent years. In the municipality of Rio de Janeiro, a recent survey revealed that FNS affects the poorest segments of the population, concentrated in deprived and neglected areas, indicating the urgency of structural actions to guarantee the Human Right to Adequate Food (HRAF) (Sallles-Costa 2024). This assessment of IAN in the state capital—the first to conduct such mapping within its territory—aims to identify the reality of hunger among Rio's population and inform policies to combat hunger (Sallles-Costa 2024).

In the study conducted by Neves and Tabai (2019), it was noted that the food provided by the PAA program to beneficiary institutions in the municipality of Cachoeira de Itapemirim was the primary source of fruits and vegetables in 50% of the institutions. Only 33% of these institutions have a budget for purchasing this category of food. The benefits identified included the ability to create weekly menus, the introduction of previously unconsumed foods, healthier and more nutritious meals for the institution's users, greater variety and nutritional quality of the food, and the capacity to create varied menus.

The production and distribution of 13,795.51 kg of agroecological food by the agroecological production unit and its social allocation reinforce the project's alignment with global and national efforts to reduce Food Loss and Waste (FLW) and the fulfillment of Sustainable Development Goal (SDG) 12.3 (UN 2022). Reducing FSW is seen as an opportunity for multiple benefits, as it contributes to mitigating greenhouse gas emissions, strengthening food and nutritional security (FNS), and ensuring the sustainability of agri-food systems.

In the Brazilian and regional context, household food waste is significant. A study conducted in the city of Rio de Janeiro, for example, found an average of 77 kg of food wasted per person per year (United Nations 2024). This figure is close to the global average for household food waste, which is 79 kg *per* capita per year (United Nations 2024). The agroecological production unit's emphasis on providing fresh, *unprocessed* food, while working to prevent waste and redistribute surpluses, aligns with the top priority in the hierarchy of actions against food waste.

The Ministry of Development and Social Assistance, Family, and Hunger Alleviation (2025) recognizes that circular food systems create conditions to expand low-income populations' access to healthier diets based on *fresh* or minimally processed foods. Food donations, while essential for alleviating hunger (as the agroecological production unit does), must be complemented by structural solutions that focus on food systems, promoting short production, supply, and consumption chains, and expanding urban and peri-urban agriculture. The agroecological production unit project, as an urban and peri-urban agriculture initiative,

specifically strengthens Goal 5.2 of the Intersectoral Strategy, which seeks to support the establishment and maintenance of urban gardens with composting systems.

In this sense, the integration of social support (distribution to vulnerable populations) and the promotion of local agroecological production embodies the intersectoral approach necessary to address both IAN and PDA, transforming territorial resources into assets for FNS.

Survey of Institutions Served by the Project

Another source of information for the research was the questionnaires described in the methodology, aimed at conducting analyses based on the responses of 11 representatives from the beneficiary institutions, which help establish the profile of those served, as well as the contributions of food to the food security of the people served. Only one of the villages did not respond to the questionnaire. The questions initially aimed to outline a profile of this population, and based on the responses, it was observed that 70% of the beneficiary institutions serve a predominantly female population, while only 10% serve a predominantly male population, and 20% of the institutions serve a mixed-gender population. The data obtained in Maricá indicated that the majority of the served population was predominantly female (70%) and had low educational attainment, with 60% having completed elementary school and 10% having not completed elementary school. When corroborated with the previous data, it is possible to establish a relationship between the low educational attainment of most of the people served, a low per capita income, and limited access to food.

This association between low educational attainment and vulnerability is corroborated by IAN studies in other vulnerable populations. In Guaratuba, Paraná, for example, a study conducted with families seeking assistance at Social Assistance Reference Centers (CRAS) indicated that 81.6% of them were experiencing food insecurity (FI), with 61% in severe FI (Vieira and Quadros 2024). Severe IAN was prevalent among individuals with incomplete elementary or high school education, in contrast to those with food security (SAN), who had completed elementary school or higher (Vieira and Quadros 2024). In Rio de Janeiro (the capital), households headed by individuals who had completed only elementary school had the highest proportions of moderate and severe food insecurity (15.0% and 16.6%, respectively) (Sallles-Costa 2024). This demonstrates that low educational attainment is a determining factor for the severity of IA and reinforces the importance of policies supporting this population, such as the UPA project (Sallles-Costa 2024; Vieira and Quadros 2024).

In another study, the research indicated access to food, by related groups, namely Monteiro and Tabai (2021), in a study conducted in the municipality of Juazeiro do Norte, Ceará, on public policies for food and nutrition security, highlights that food security is associated with conditions related to agricultural production factors, distribution, trade, food quality, water quality, sanitation services, local food culture, governance, and political stability.

The emphasis on local and agroecological production, therefore, reinforces the appreciation of the municipality's territorial resources. The promotion of SAN depends on public policies that facilitate and encourage territorial resources (tangible or intangible) to become assets for local development and the overcoming of social inequalities, requiring the effective participation of local actors (Vieira and Quadros 2024).

Next, the study sought to understand the relationship between the institutions served by the project; to this end, each representative was asked to rate the project's importance to their institution, with the options "reasonable," "low," "high," or "essential." The results showed that 70% rated it as "essential," 20% as "high," and 10% as "reasonable" (Table 2).

Table 2. Profile data of those served by the beneficiary institutions in Maricá from 2020 to 2022, Maricá-RJ.

n=10	Characteristic	Absolute frequency	Relative frequency
Predominant Gender of the Institutions' Clientele	Predominantly Male Audience	1	10%
	Mixed-Gender Audience	2	20%
	Predominantly Female Audience	7	70%
Age Group of Institutional Audience	16–17	1	13%
	20–40	1	13%
	60–70	1	13%
	70–80	1	13%
	Mixed-Age Audience	6	75%
Educational Level of the Institutions' Audience	High school dropout	1	10%
	High school graduate	3	30%
	Incomplete elementary school	6	60%

Source: questionnaires administered (2022).

Salvato et al. (2010) base their argument on the relationship between low *per capita* income in the poorest regions and the concentration of individuals with low educational attainment (low human capital) and limited physical capital, which results in low incomes for these populations. According to the II VIGISAN (PENSSAN 2022), 42.5% of households headed by individuals with up to four years of schooling have a moderate or severe Food Insecurity Index (FI). This implies a compromise in the availability of food for consumption.

By corroborating the previous data, it is possible to establish a relationship between the low educational attainment of most of the people served, low *per capita* income, and limited access to food. All of this reinforces the importance of public policies aimed at access to healthy foods, such as the project targeting this population.

Next, the survey sought to understand the relationship between the institutions served by the project. To this end, each representative was asked to rate the project's importance to their institution, with the options "reasonable," "low," "high," or "essential." The results showed that 70% rated it as "essential," 20% as "high," and 10% as "reasonable."

When asked whether the institutions already received *fresh* food through other sources, 80% said they did not, and 20% said they did. This information reveals that 80% of the 11 institutional representatives interviewed received *fresh* food solely through the project that is the subject of this study. According to the Dietary Guidelines for the Brazilian Population (Brazil, 2014), the promotion of adequate and healthy nutrition stems from *fresh* foods—obtained directly from plants or animals without having undergone any alteration (or minimally processed). The importance of encouraging and providing access to *fresh* foods is supported by various references in the field, and the foods delivered through the project, such as green baskets, can facilitate and encourage the consumption of these foods.

Next, those in charge were asked whether the institution received pesticide-free food from any other source, and all stated that they did not receive pesticide-free food from any source, with the project being the sole channel for accessing pesticide-free food.

During the First Pesticides and Cancer Seminar, organized by the National Cancer Institute (INCA) with support from the National Health Surveillance Agency (Anvisa) and the Oswaldo Cruz Foundation (Fiocruz), the sector took a stand against current pesticide use practices in Brazil and highlighted their health risks, particularly regarding cancer causes. According to INCA, the latest results from Anvisa's Pesticide Residue Analysis Program (PARA) revealed pesticide residues above the permitted limit and the presence of chemicals not authorized for the food in question (National Cancer Institute 2015).Therefore, providing access to pesticide-free food contributes to maintaining the health of the beneficiaries, since ensuring food security is related not only to sufficient quantity of food but also to adequate quality.

To ensure access to healthy, pesticide-free food, public policies are needed that operate in an intersectoral manner to strengthen family farming production. However, when designing these policies, it is essential to consider the various factors related to their implementation, including the government's role in adapting actions to local realities (Monteiro et al. 2018). In this context, programs such as the Food Acquisition Program (PAA) and the National School Feeding Program (PNAE) stand out as central instruments, but their full potential is only realized when they operate in an integrated manner, coordinating public procurement, technical assistance, rural extension, logistics, financing, and Food and Nutrition Education (EAN) (Sambuichi et al. 2022; Silva et al. 2023).

Recent evidence demonstrates that the simple act of purchasing is not sufficient. Studies on the "milk" component of the PAA reveal that the program's success depends critically on intersectoral institutional arrangements, ranging from technical assistance and quality control agencies to distribution logistics (Silva et al. 2023). Similarly, analyses of the PNAE show that gaps in inter-institutional coordination and municipal management capacity are key factors in the poor performance of food procurement from family farms, limiting access to fresh and healthy foods in schools (Rodrigues et al. 2024).

The promise of pesticide-free school meals based on local production, supported by legislation linking the PNAE to family farming, faces operational obstacles. Logistical bottlenecks, such as insufficient cold chains, transportation, and local processing capacity, prevent institutional purchases from fully translating into a regular and sustainable supply (Souza et al. 2022; Silveira et al. 2024). Overcoming these challenges requires coordinated action beyond procurement, integrating infrastructure and rural extension policies.

The participation of clients served by the beneficiary institutions in the project's training activities, such as courses and field trips, was also investigated. Only 30% of the institutions reported that their clients had participated in these activities, while 70% of them did not have access to the project's training opportunities. This information suggests that most clients may lack a clear understanding of how food is produced. When asked about their interest in participating and obtaining information, 70% expressed interest, indicating an opportunity to expand the project's scope to include training targeted at the beneficiaries (Table 3). This would help provide residents with the opportunity to learn about food production and gain knowledge on environmental issues and everyday ecological practices, which could promote and encourage healthier eating habits.

Table 3. Beneficiaries' Participation and Interest in Training Activities, Maricá-RJ, 2022.

Question	Response	Relative Frequency
Participation of beneficiaries served by the recipient institutions in the project's training activities	Yes	30%
	No	70%
Interest in participating in the project's training activities	Yes	70%
	No	30%

Source: questionnaires administered (2022).

The interest expressed by at least 66% of respondents in establishing a garden—whether at home or collectively within an institutional setting—goes beyond mere quantitative data and represents a clear and significant social demand for spaces dedicated to food production and hands-on learning. This finding is strongly supported by the literature, which documents widespread acceptance and the multiple pedagogical, nutritional, and socio-environmental benefits of school and community gardens (Savian et al. 2021; Santos et al. 2023; Soares et al. 2024).

Empirical evidence demonstrates that the implementation of gardens in institutions such as schools, associations, and health facilities fosters the integration of education, service, and community, promotes healthier eating habits, and encourages the production of organic food, offering concrete pathways to address the needs identified by participants (Bennedetti et al. 2022; Nasr et al. 2022; Righi et al. 2022).

For this widespread demand to translate into sustained impact, the specialized literature recommends the adoption of participatory planning strategies and shared governance (*co-design*), the continuous training of the actors involved, and the incorporation of techniques such as composting and agroecological practices—measures that significantly enhance the technical feasibility and pedagogical potential of the project (Schú et al. 2021; Machado and Selau 2023). Furthermore, linking the garden to institutional extension activities and public policies on food and education tends to enhance its social and educational effects, strengthening community ties and enabling participatory evaluations (Bartsch et al. 2021; Figueiredo et al. 2021; Santos et al. 2023).

In summary, the 66% figure justifies prioritizing vegetable gardens in the institutional action plan and guides fundamental operational decisions—such as the choice between home-based and collective models, curricular integration, an emphasis on organic production, and the creation of participatory monitoring mechanisms—that maximize educational, nutritional, and socio-environmental gains, as attested by specialized evidence (Silva et al. 2022; Soares et al. 2024; Targino and Tabosa 2024).

Conclusions

The production and distribution of agroecological foods demonstrated that the project contributed to providing people in socially vulnerable situations with access to meals and green food baskets. The research shows that these foods were grown using agroecological principles.

It was observed that the food reached people with socioeconomic profiles most vulnerable to food and nutritional insecurity. It can be considered that initiatives such as this project can contribute, to some extent, to access to healthy foods, particularly *fresh produce*, and highlights the need for other forms of assistance focused on addressing food and nutritional security.

In addition to the food produced, it is important to consider the environmental services provided at the sites, such as soil conservation practices and the restoration of food species diversity, which contribute to achieving the Sustainable Development Goals (SDGs), especially SDG 2—zero hunger and sustainable agriculture.

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