Chapter 72

ODS agroecological urban agriculture and food security in Palmas-TO

10.56238/tfisdwv1-072

Keile Aparecida Beraldo
Affiliation: Universidade Federal do Tocantins
E-mail: keile@uft.edu.br

Rayele Moraes Silva
Affiliation: Universidade Federal do Tocantins
E-mail: rayele.moraes@uft.edu.br

Rose Mary Gondim Mendonça
Affiliation: Universidade Federal do Tocantins
E-mail: rosemary@uft.edu.br

Maria Emilia Mendonça Pedroza Jaber
Affiliation: Universidade Federal do Tocantins
E-mail: milajaber@gmail.com

ABSTRACT
Urban agriculture is a strategy of empowerment of people inserted in this activity, which preserves the urban environment and improves the quality of life of the population. Thus,*the portunizes the* needy families the cultivation of food for consumption and/or commercialization, occupies the idle spaces in the urban environment, as well as values it. Therefore, this paper publicitises public policies and urban agriculture initiatives in the municipality of Palmas, indicates twelve public areas with families and proposes inclusive actions to strengthen the agroecological transition in family urban agriculture and the collective construction of new sustainable practices based on environmental education and food and nutritional security.

Keywords: Urban agriculture, Inclusive actions, Agroecological transition, Sustainable practices.

1 INTRODUCTION

According to the Food and Agriculture Organization of the United Nations (FAO, 2020) the Sustainable Development Goals are expected to be achieved in the next decade. As agriculture and food are the main actors in these 17 objectives, FAO recognizes that a holistic approach is key to achieving this goal. All global challenges are interconnected – as well as solutions. Thus, if sustainable agriculture and food are promoted around the world, poverty reduction and hunger will occur, and consequently climate change will be tackled and natural resources preserved for future generations. Thus, by transforming agricultural and food systems, the future is transformed.

IPES-Food (2020) points out that millions of people globally can fall into extreme poverty and with COVID-19 increased widespread income losses, an increasing number of consumers may not be able to buy food, increasing the crisis of food and nutritional insecurity.

This said, the scientific community and managers around the world, has been seeking solutions to limit the use of non-renewable natural resources, as well as to ensure the food and nutritional security of families living specific vulnerabilities arising from poverty contexts. Faced with the urban challenges of today, and which tend to worsen in the future, urban agriculture has been increasingly recognized as an alternative to integrate solutions in the social, economic and ecological aspects of cities (FAO, 2019).

In this work it is understood that non-sustainable agricultural problems have contributed a lot to the problems of the environment, both in the countryside and in the city. Problems such as soil degradation, deforestation and greenhouse gas emissions. However, according to FAO (2020) at the same time the

agricultural sector is the cause, it can also be part of the solution to the world's environmental problems. In our current climate emergency, changing agricultural and food systems to be more climate-conscious, more sustainable, innovative, nutritious and resilient is at the heart of the necessary changes.

Altieri and Nicholls (2020) emphasize that from the socio-ecological fragility revealed during the health emergency, there has been renewed attention to the potential of agroecology around its ability to dispense pesticides, revitalize small properties, create alternative production systems and reform urban agriculture. Long before the pandemic, there was already an ingrained criticism of industrial agriculture, its dependence on non-agricultural insums and its great risks to human health and the ecosystem (**Altieri et al., 2015** *apud* SCRIBANO et al., 2020).

According to Altieri and Nicholls (2020) there is an urgent need to develop agricultural solutions to some of the new situations that emerge from the pandemic. And agroecology points to a path for the reconstruction of post-COVID-19 agriculture and can form the basis of a new food system by strengthening action in five major areas, which allows rethinking the relationship between agriculture, nature and human health.

Thus, several authors advocate small-scale agroecological initiatives both in rural and periurban and urban territories. For, it plays a significant role in the supply of food, that is, they provide food to a portion of the population without prioritizing the logic of maximizing the benefits of caring for the environment. *Agroecology can also contribute to the mitigation and adaptation to climate change, favoring the restoration, diversification and conservation of ecosystem services and avoiding soil degradation. This corroborates the Sustainable Development Goals (SDGs).*

According to the city development index (IDSC - BR) the municipality of Palmas-TO has reached three SDGs, in six there are challenges, two there are significant challenges, six are major challenges among them to eradicate hunger, quality education, gender equality, reduce inequalities and quality health (LEAL, 2021).

This is said to be understood that the increase in biodiversity is at the heart not only of the agroecological strategy, but also in the eradication of hunger in the world. The idea is that agroecosystems mimic biodiversity levels and the functioning of local ecosystems. Thus, the question that guide this work is: Can the city of Palmas, capital of the State of Tocantins, planned to be the irradiator center of development of this State, become an important food producer since there are several areas with this potential?

The main objective of the work was to map and present public areas in the city of Palmas, Tocantins with the potential to develop projects of Agroecological Urban Agriculture and Environmental Education.

It is worth mentioning that although a planned and young city, Palmas has several peripheral areas with limited accessibility and infrastructure, where the soil is less valued and occupied, basically, by low-income populations, who live in obvious conditions of economic, social and environmental precariousness,

having, consequently, their quality of life compromised. This fact has been criticized by different urban planning researchers.

Kran et al., (2006) also consider that the model used for occupation of the city tended to form voids or "scatterings", through discontinuity in the occupation of urban land, where plots (lots) were, at first, unused, being used later for real estate exploration. The policies of use and occupation of urban land that have been in force since the beginning of the occupation of the city, together with urban instruments, were used to legitimize this model of occupation.

Given this scenario, this work seeks to map idle areas where garden gardens and urban agriculture can be developed in productive agroecological systems in different regions in the city of Palmas - TO. Thus, it is intended to establish inclusive actions to strengthen the agroecological transition in family urban agriculture and in the collective construction of new sustainable production practices, as well as to promote development and ensure an awareness focused on environmental conservation, supported by organizations involved in agroecological insertion, environmental education and food and nutritional security.

2 URBAN, PERIURBAN AND AGROECOLOGICAL AGRICULTURE BOOSTING FOOD SECURITY AND INCOME GENERATION FROM ENVIRONMENTAL ACTIONS

2.1 URBAN AND PERI-URBAN AGRICULTURE

Melo (2016) defines that Urban and Periurban Agriculture (AUP) "is a multifunctional and multicomponent activity, which includes the production or innocuous transformation of agricultural and livestock products in intra- and periurban areas for self-consumption or commercialization, (re) efficiently and sustainably taking advantage of local resources and insum, promoting urban, social and environmental management of cities, contributing to improving the quality of life of the population."

Urban agriculture assumes responsibilities from cultural, political, environmental, economic and social in the lives of people of cities, with the idea of providing a new meaning to public and private empty spaces through the implementation of productive environments both community and residential (MACHADO; MACHADO, 2002 apud CAMILO et al, 2018).

The concept of urban agriculture covers a number of dynamic factors that concern urban and sustainable development (SOUSA, 2019).

> The dynamics of urban food systems and changes in demand for food products – regional, national or international origin (processed or not) – drive changes in food production and trade, with major implications for small farmers, rural and peri-urban producers, and offer important opportunities to improve the lives of the marginalized population. (FORSTER; HUSSEIN; MATTHEISEN, 2015, p.14)

According to Ferreira (2013), the definition of Urban and Periurban Agriculture (AUP) correspond to the areas within and in the vicinity of the urban environment that have some kind of agricultural activity.

These spaces can be private, collective or public areas within and between the contours of cities, including public roads, squares, parks and idle areas such as lots and vacant land.

There are advantages that can be obtained through urban agriculture, Roese (2003) cites: food use; rational use of spaces; environmental education, food safety; recreation and leisure; home pharmacy; microclimate formation and biodiversity maintenance; rainwater runoff and decreased temperature, aesthetic value; poverty reduction; occupational activity and income.

For Melo (2016) the benefits of urban agriculture is to promote urban sustainability, given that the planting and consumption of food without the use of pesticides, the use of rational practices, which allows the recovery of environmentally degraded areas. Therefore, urban agriculture uses ecological bases, ensuring food and nutritional security, the promotion of work and income for the population.

Aquino and Assis (2007) apud Carneiro et al (2016) point out that urban agriculture as a phenomenon of affront to economic and political crises, through its organization, forming new possibilities of survival in the city.

In this point of view, urban agriculture gives the opportunity for families in need of a complementary or even main income, with cultivation of food for consumption and/or marketing. At the same time, public management enables in urban planning the insertion of such activities as ways of expanding green areas in cities and contributing to the formation of microclimates, as well as local recycling of urban organic waste (ZEEUW; Guindel; WAIBEL, 2000 apud HIRATA, et al 2010).

The agricultural use of urban spaces helps in the maintenance of the local environment, either by stimulating people's environmental perception, through the reduction of the amount of garbage produced, preservation of green areas, contribution to urban biodiversity and recovery of risk areas, in addition to beautification of cities, (MOURA; FERREIRA; LARA, 2013).

2.2 URBAN AND AGROECOLOGICAL AGRICULTURE

Authors such as Ribeiro et al (2012) and Ribeiro, Bógus; Watanabe (2015); Sousa and Calaça (2019) emphasize that urban agriculture is a strategy of empowering people inserted in this activity, maintenance for the urban environment and improvement in the quality of life of the population. However, these benefits cannot be achieved by any cultivation model. Ribeiro et al (2012) is an advocate of agroecological practices in agriculture.

> It is believed that urban agriculture can only be considered as a promoter of health if practiced in the light of agroecology, because it proposes a harmonic interaction with natural resources, minimizes aggressions to the environment and considers all beings present in nature as allies, using biological indicators to analyze their practices in the search for better quality of life. By minimizing the impacts on human health, agroecology offers the possibility of achieving a healthier life. (RIBEIRO el al, 2012, p. 386).

Gliessman (2000) defines agroecology as "the application of concepts and principles derived from ecology in the construction and management of production systems". In parallel to Altieri (1987),

"agroecology is a science that studies agroecosystems integrating knowledge of agronomy, ecology, economics and sociology". Agroecology is a set of practices that start from the foundations of ecology, which relate to social movements and encourage sustainable development.

Agroecology values cultural and biological diversity, recognizes the importance of traditional knowledge of traditional populations, recovery of Creole varieties, in favor of strengthening more sustainable agroecosystems (ALTIERI, 2004; EMBRAPA, 2006).

Agroecological practices present a new alternative to agricultural systems, with strategies of principles on how to design and manage agricultural systems better able to withstand future crises - be it pest outbreaks, plagues, climate disturbances. In this sense, agroecology enables a skilled path, with the ability to deal with future adversities, as it provides ecological diversity and resilience, reconciling reasonable economic and economic benefits (NICHOLLS, ALTIERI and VAZQUEZ, 2016).

Putting into practice the agroecological principles bring positive results to the environment, with purposes that achieve the realization of the essential processes necessary to maintain the productivity of urban agriculture. Effective results such as optimal nutrient recycling and organic matter renewal for soil fertility, closed energy flows, water and soil conservation and improved pest regulation (ALTIERI and NICHOLLS, 2018).

Ribeiro et al. (2012) reinforces that a "new look at the environment can arise from the involvement of subjects with Agroecological Urban Agriculture", points to the growth of people's environmental perception, aiming at the preservation of ecosystems, with the implementation of sustainable practices in homes and communities.

The relationship between urban agriculture and agroecology, known as urban agroecology, can "help create the principles and dimensions of an agro-ecological approach to production systems, social issues and urban territories" (BIAZOTI; ALMEIDA; TAVARES, 2017).

Almeida (2004) apud Camilo (2018) mentions that the productive use of urban spaces harmonizes with cleaning of these places and a considerable improvement of the local environment, reducing the proliferation of disease vectors.

> [...] urban agriculture and agroecology are alternatives to: establish short circuits of production and consumption; expand the integration between natural and social spaces; innovating forms of popular organization; in addition to bringing new perspectives to the debate on the importance of quality of life in cities, connecting the value of use of urban space and the social function of property. (ALMEIDA, 2011, apud O'REILLY, 2014, p.24).

2.3 SAFETY TO BE ENSURED AND G ERAATION OF RENDA

Food sovereignty is directed to human rights and food production. Through the implementation of food systems, food sovereignty evidences the recovery of land, food, livelihoods for survival and direct participation in the project of individuals in food insecurity situations (CLENDENNING, DRESSLER AND RICHARDS, 2016 apud LOKER and FRANCIS, 2020).

And it is in this sense that Urban Agriculture (AU) can contribute to food security through food production, for this, it is essential a planning that allows to achieve the equitable distribution of access to quality food, especially vulnerable populations, through switching actions. Access to safe food is a concern of many families and public authorities who have perpetuated themselves over the years (SMIT, MASR And RATTA, 1996 apud CARNEIRO et al., 2016).

Thus, "the increase in productivity of urban agriculture contributes to local food security, increasing the capacity of families to have access to food and improves nutrition, increasing the capacity of families to diversify diets" (MAXWELL, 2002 apud ALTIERI and NICHOLLS, 2020).

Monteiro (2002) points out that the main help of Urban and Periurban Agriculture is in the creation of occupation and income for the poorest population and the consequent improvement in quality of life.

> The creation of occupation and income for the poor and the consequent improvement of their quality of life constitute the great economic contribution of urban agriculture that can also increase resources in communities with the aggregation of income, which can be obtained from direct sales to the population living in the surroundings of the community, or by some kind of preprocessing, production of jams (MONTEIRO, 2002).

Fernandes (2013) reinforces that urban agriculture promotes the insertion of individuals in the labor market and income generation. Thus, the gardens contribute to the individuals involved in the consolidation of social relations, to conduct dialogues about the local conjuncture common to all and the role of social organization in the face of this panorama.

2.4 PROMOTION OF ENVIRONMENTAL EDUCATION

Environmental Education plays an important role in raising awareness for practices that minimize negative environmental impacts. According to Law 9,795/99 of April 27, 1999, Art.1:

> Environmental education is understood as the processes through which the individual and the collectivity build social values, knowledge, skills, attitudes and competencies aimed at the conservation of the environment, good of common use of the people, essential to healthy quality of life and its sustainability (DIÁRIO OFICIAL DA UNIÃO ON-LINE,, 1999, p.1).

Environmental education, in fact, is a tool that grants knowledge about environmental issues, it is a study that provides a new look at environmental awareness capable of building transforming agents with regard to environmental conservation (NÓBREGA et al., 2015).

According to Ruscheinsky and Vargas (2012), "environmental education brings with it awareness about the perception of elements that shape everyday life (land, water, air, among others) ". It helps to stimulate the search for appropriate solutions for the preservation and conservation of the environment, through environmental damage (BRITO et al., 2016).

Ferreira and Castilho (2016) highlight the importance of the environmental issue in urban agriculture, so those involved in the activity enjoy new technologies, and can use more sustainable practices such as the reuse of water for the activity, use of composting. At the same time, environmental education

is considered with the objective of promoting environmental perception in favor of environmental conservation, which corroborates in a greater relationship with the environment in which they live and facilitates ensuring with economic growth and, successively, quality of life (PERNA, 2013).

For the PEAFF - Program of Environmental Education and Family Agriculture even focused on the rural environment, they argue that environmental education to be developed should cover "the conception of the environment in its entirety, considering the interdependence between the natural, socioeconomic and cultural environment, under the focus of sustainableness" (BERNAL and MARTINS 2015 apud CARMO, 2019). And it also puts it that to achieve this sustainability it is necessary to empower farmers through knowledge of information and an exchange of knowledge:

> the desired sustainability for family farming must be sought from educational practices and socio-environmental projects that stimulate not only the exchange of production techniques, but the transformation of the set of social and productive relations existing in rural areas. (BERNAL and MARTINS, 2015, p.15).

Carmo (2019) stresses that the deficiency of more institutionalized and contextualized public policies in the environmental formation of actors who produce agriculture in urban space is an essential instrument for empowering these ecological subjects.

Leroy & Pacheco (2011) argue that "true environmental education must be concerned with protecting not only waters, air, forests, flora and fauna, but also men and women who, often precisely because they gather all the characteristics that make them susceptible to environmental injustice, poverty, poverty, risk situation in every way, mainly lack of (in)formation and ignorance become, at the same time, victims and tormentors of their surroundings". Thus, the implementation of urban agriculture in cities is presented as promoting the environmental perception of those involved and conservation of natural resources, as well as aiming to ensure access to food in search of food and nutritional security.

3 METHODOLOGY

This work is characterized as a descriptive research with quantitative and qualitative procedures structured with a literature review on the themes Sustainable Cities, Urban Agriculture, Agroecology and Environmental Education. Information from secondary databases was used through reports and documents provided by the Municipal Environment Department of the municipality.

Its focus of interest is the municipality of Palmas -TO being mapbed with the tools Google Earth and ArcGIS, using secondary data provided by the Municipal Department of the Environment of Palmas and zoning of the municipality of Palmas / TO. With the Google Earth tool, the community gardens established and in operation were identified, and potential areas for the implementation of community gardens were indicated considering: public places where there is ample land with apparent disuse; places with predominance of vulnerable populations; and proximal location of a radius of 500 m of areas with

housing. These areas identified in Google Earth were delimited and exported to ArcGis which allowed the map to be drawn up.

The results of the research were described and analyzed from the references presented on the themes of sustainable cities, urban agriculture, agroecology and environmental education. And from this, it was proposed a project of Agroecological Garden in the municipality of Palmas/ TO, focusing on the promotion of Environmental Education and food and nutritional security.

4 CHARACTERIZATION OF THE AREA

The capital of Palmas, located in the central region of the State of Tocantins, is a city planned on north and south roads, with urban parks, immense squares and strategically designed green areas. Inaugurated in 1989, it has a privileged geographical position, functioning as a link between the North region and the other regions of the country. It has a territorial extension of about 2,227,329 km² and an estimated population of 313,349 people (IBGE, 2021).

The city of Palmas was architected under an ecological vision, so for the design of the Urban Plan were based on environmental concerns with some indicators that later guide the Master Plan, which included:

> "the green areas essential to thermal comfort by the formation of micro climates less; the preservation of riparian forests near the riverines; among others. With regard to ensuring quality of life, "urban planners sought to design a pleasant city to live and work with a viable structure from an environmental, economic and social point of view (...)" (DESIGN MEMORY - GROUP FOUR, 1986).

Under the influence of the Federal Constitution of 1988, for the projection of the capital of the state of Tocantins was that instituted from principles of environmental preservation linked to the improvement of quality of life. This ecological perspective becomes evident in this quotation: "the project of the future capital of the State of Tocantins was, therefore, preceded by another type of dream: ecological and humanistic" (PLANO BÁSICO/MEMÓRIA – GRUPOQUATRO, 1989).

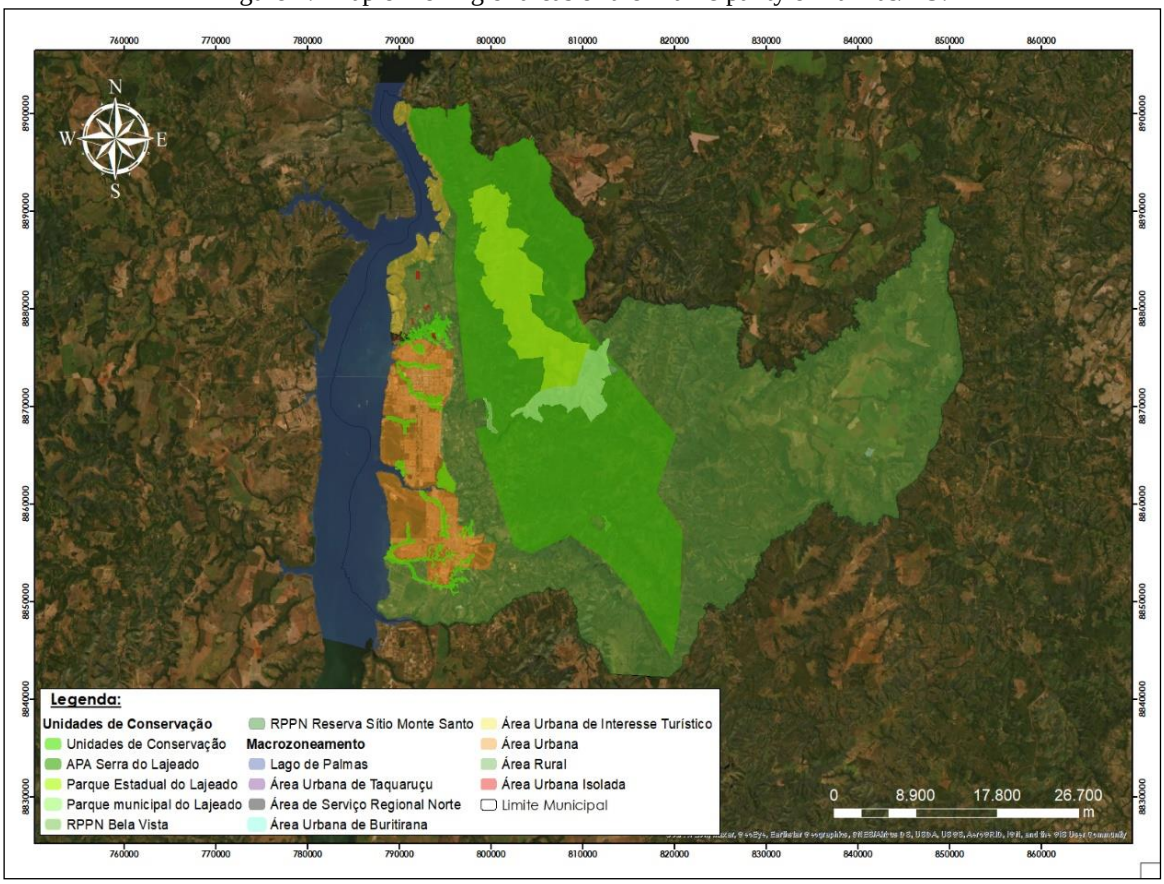
The expression Palmas ecological capital began from advertising of the late 1990s, since the capital Palmas was seen as a single planned city under construction in the world, with its bold Master Plan traces, in its futuristic architecture, the lines of development for the State and the central region of Brazil.

> Considered the ecological capital of the year 2000, Palmas was planned to shelter in perfect harmony man and nature, without prejudice to the environment (PROGRESSO, 1996, p. 2 apud FIGHERA, 2005).

This slogan perpetuated due to the large amount of green areas that harmonizes the urban landscape, the plan of landscaping and afforestation, since the city is under trees, its natural beauties and its streams are bordered by green areas. Also known as "Ecological Capital", Palmas is one of the capitals with the largest wooded public area in the country (AMATUR, 2002, apud FIGHERA, 2005).

Because Palmas is designed, unlike many Brazilian cities, and enjoys favorable conditions, to implement the green to its reality in a harmonious way, a system of green areas composed of ecological parks, urban parks, linear parks, community green areas, permanent preservation areas, conservation units, environmental preservation areas was proposed (Figure 1).

Figure 1. Map of zoning of areas of the Municipality of Palmas/TO.



Source: Author (2021).

5 POLICY TO SUPPORT COMMUNITY GARDENS

The resolution of the City Statute establishes "that property must fulfill a social function", the Participatory Master Plan of the Municipality of Palmas, exposes among the priority themes of establishing conditions and opportunities for income generation through areas for urban and rural economic activities, as highlighted:

> Creation of conditions and opportunities for income generation, employment and work in large numbers, through the definition of areas for urban and rural economic activities, with economic strengthening and entrepreneurship in private and public management, in a sustainable development model (COMPLEMENTARY LAW No. 155, DECEMBER 28, 2007 DE PALMAS/TO).

Together, the Municipal Complementary Law also prioritizes the promotion of the humanization of the city, with regard to the proper use, preservation and conservation of green areas, aiming at the contact and enjoyment of the population with them and in addition to the creation of areas for local development. In parallel, the planning that takes into account the environment should detect the points of vulnerability

and areas of environmental risks for the settlement of the population and enterprises (MOURA, FERREIRA And LARA, 2013).

Considering among the priority themes mentioned in the law in the complementary Moura, Ferreira and Lara (2013) point out that the Master Plans need to induce the practice of Urban and Periurban Agriculture in urban spaces, guided by agroecology, to transform people and local communities' lives. It is necessary to strengthen the organization of urban farmers through articulations with civil society and political intervention in the construction of healthy, productive and solidary cities in the Brazilian urban environment.

In the municipality of Palmas, the Hortas Urbanas project emerged in 1992, being managed by the City of Palmas through the Municipal Secretariat of Rural Development (SEDER). The first gardens were established in the neighborhoods Aureny III, 1106 Sul and 307 Norte in order to improve the social and economic aspects of the poor population arriving in the newest capital in search of job opportunities (SOUSA, 2019).

SEDER is responsible for assisting producers, providing technical assistance and providing the basic structure of vegetable gardens, such as water, soil preparation and fence of lambrado. Eventually, there is the distribution of seeds, fertilizers and equipment to horticulturales. Technical assistance is focused on the transfer of technology to agroecological production. For this, lectures, courses, training and field days are held with horticulturales. The aim is to transfer to them the necessary knowledge about the alternative control of pests and diseases, aiming at agroecological production, preserving the health of horticulturalists, residents near the vegetable gardens and consumers.

Ten years later, on June 22, 2012, the Community Gardens Program Regulation was established through Municipal Decree No. 284 of June 22, 2012 (PALMAS, 2012). Through the device, horticulturales began to have their rights and duties, related to the vegetable gardens, documented. The objectives of the Community Gardens Programme cover: promoting the practice of horticulture in the urban and rural perimeters of the capital; promote the supply of healthy and low-cost foods; promote social inclusion by offering beneficiaries and their families an alternative source of employment and income; take advantage of idle public spaces with productive activity; community sense for the proper use and maintenance of public space and respect for the environment.

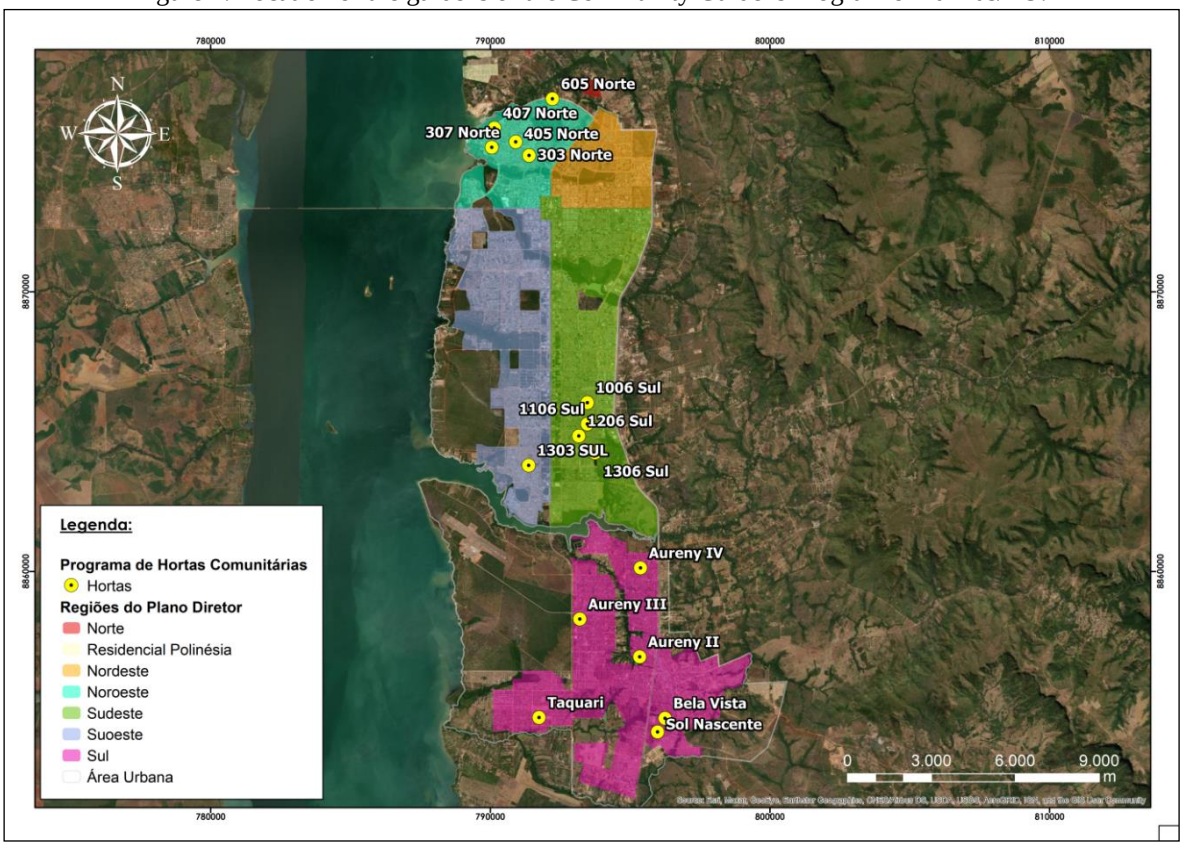
The regulation is responsible for establishing the guidelines for the occupation of idle urban spaces, for the purposes of urban agriculture, is municipal, through the inclusion of these spaces in the Master Plan of the municipalities, for example. However, there are national-scale promotion programs that select, through edicts, spaces and actors for financing and implementing urban agriculture projects in areas of social vulnerability in cities in metropolitan regions that present these underutilized spaces (CARMO, 2019).

The incentive for the construction of urban gardens, established by the government, provide actions opposed to the interests of capital and, consequently, approach urban sustainability, since, as Madureira (2005) states, they encompass the three pillars: social, economic and environmental (COMITRE, 2019).

The initiative to produce food with the participation of the community, in areas close to their homes, in Palmas (TO), has promoted social inclusion and food security for the elderly, women, young people, and the entire family of whom it produces. Currently, the 23 gardens implemented by the City of Palmas (Figure 2) directly serve more than 500 families and 2,000 indirectly, as a source of income complementation of these people in unemployment and improved access to adequate food (PALMAS, 2021). The

Figure below shows the locations of the gardens of the Community Garden Program of the City Hall.

Figure 2. Location of the gardens of the Community Gardens Program of Palmas/TO.



Source: Author (2021)

Sousa (2019) presents the profile of horticulturales with an average age of 43 years, which shows one of the adult labor in agricultural activity and the low participation of young people in urban agriculture, with respect to managers with leadership positions 41% are female in counterpoint that 72% of the workforce is feminine. Therefore, male majority leaders are responsible for meetings, warnings, and claims with SEDER. It is clear the lack of equity between genders and the need to reduce them. Regarding the level of education, most of them have incomplete elementary school.

Branco and Alcântara (2011) states that the region's producers are mostly populations in a state of social vulnerability as unemployed, in addition to retirees, people with low educational level, individuals

over 40 years and predominantly women. Demonstrating that the scenario has changed little in 8 years, reinforcing the issue of inequality, the need for quality education that reaches this population to eliminate existing gaps and reduce social tensions.

The role of food security and income generation is observed, because the producers perform self-consumption of vegetables, but are also separated products for the rental sale (neighbors, intermediaries and local markets). According to the Municipal Department of Rural Development (SEDER) in 2018 the average monthly income was around R$ 810.00 which understands how important vegetable gardens are for horticulturalists even though it is a complementary income to families. This indicates that AUP is often developed as a complement to income and self-consumption to guarantee minimum living conditions.

It is observed from studies that there are many barriers in the Community Gardens Program that prevent all the benefits of urban agriculture from being guaranteed, such as the lack of insum, infrastructure, credit, human resources and technical support, to horticultural farmers. Sousa (2019) reports that among the factors that hinder food production through the Program involve the difficulty of maintaining the gardens and quality of products, distribution support services, and providing guarantees through public policies.

With Complementary Law No. 155 of December 2007 on the Participatory Master Plan of the municipality of Palmas, it had as one of the objectives of the Master Plan: "I - to promote the sustainable development of the municipality, balancing and integrating the economic, social and environmental dimensions".

According to the Participatory Master Plan of the Municipality of Palmas, green areas are considered green areas are areas delimited by the City Hall or indicated and recorded in the plants and descriptive memorials of allotment and glebes, intended for the implementation or preservation of afforestation, landscaping, leisure and recreation, aiming to ensure good environmental and landscape conditions for the city and the contact of the population with nature.

Resolution No. 34/2005 defines that "the City Statute establishes that property must fulfill a social function, that is, the land must serve the benefit of the community, and not only the interests of its owner". Thus, the Master Plan has responsibility to indicate the social function of urban areas. Therefore, this plan has to guarantee the spaces of collective use for everyone, from places of circulation, public equipment and environmental protection areas. It can in fact guarantee adequate land for all economic activities and social classes, favoring mainly for the low-income population (MOURA, FERREIRA And LARA, 2013).

According to the Index of Sustainable Development of Cities - Brazil - (IDSC - BR) the municipality of Palmas /TO was the only contemplating in the state of Tocantins with a score of 60.17 and with 164 in the general classification of 770 municipalities.

Table 1 shows the performance of the municipality of Palmas/TO according to]IDSC-Brazil data (2021).

Table 1. Panorama of the municipality Palmas/TO

PALMS / TO	Overall score	Overall classification
	60,17/100	**164/770**

Current Assessment

SDS achieved There are challenges There are significant challenges
There are major challenges Information unavailable

Source: IDSC-Brazil Data (2021)

Three SDGs were achieved: SDGs 7- Renewable and affordable energy - municipality has 99.68% of the households served; SO 9 – Industry innovation and infrastructure in public investment in the proportion of GDP 38.24% and participation of jobs in activities intensive in knowledge and technology 44.60%; and SO 14 – Protecting marine life the goal achieved was Sewage treated before reaching the sea, rivers and streams 81.00% (LEAL, 2021).

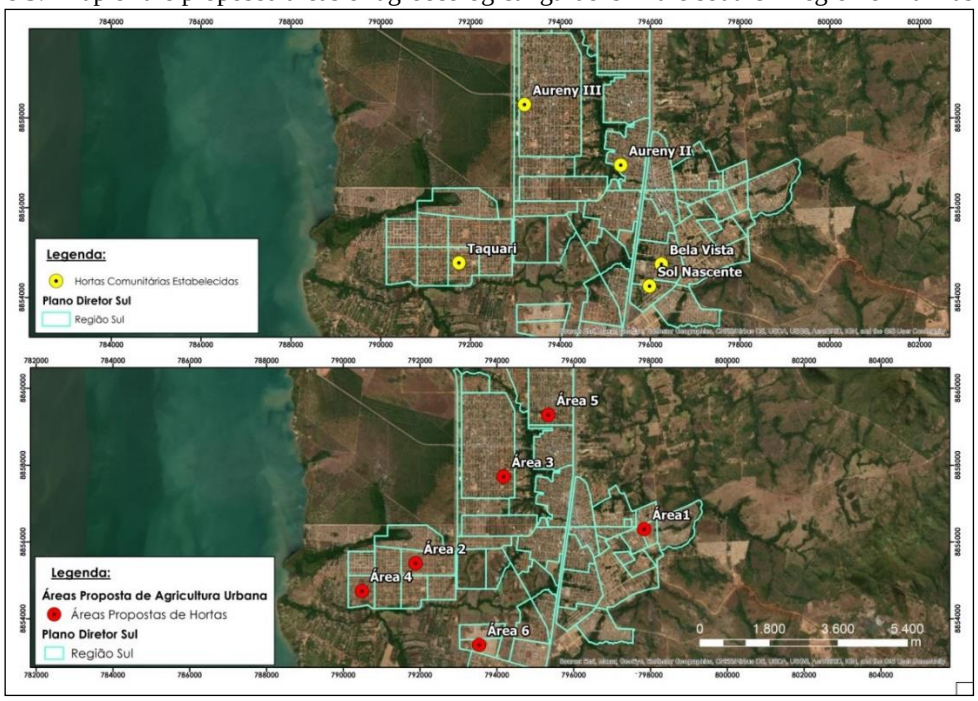
However, it is noteworthy that there are major challenges in SDD2- Eradicating hunger, SDD3 - Quality health, SDS 4 - Quality education, SDS 5 - Gender Equality, SDD 10 - Reducing inequalities, SDD 16 – Peace, justice and effective institutions. Where family farming in a periurban environment can collaborate.

6 AREAS WITH POTENTIAL FOR THE DEVELOPMENT OF AGROECOLOGICAL AU PROJECTS IN PALMAS

The results of this research indicate that in the urban area of the municipality of Palmas there is a large number of urban spaces "empty", areas susceptible to resignification with land use, providing green areas possible to promote sustainable urbanization. Enabling the stimulus to a more sustainable city with the guarantee of improving the quality of life of the population, economic development and preservation of the environment. Thus, the 12 (twelve) potential public areas for the elaboration of Agroecological Gardens were chosen.

Figure 3 shows the division of neighborhoods to city, and 5 gardens are in operation and 6 are for implantation in the blocks Jardim Aureny III, Jardim Aureny IV, Morada do Sol 3, Jardim Vitória II, Taquari T-20/T-21 and Taquari T-33/T-43. It is observed that these´ blocks have high population density and mostly composed of residents with lower income, exposed to the ills of urban centers.

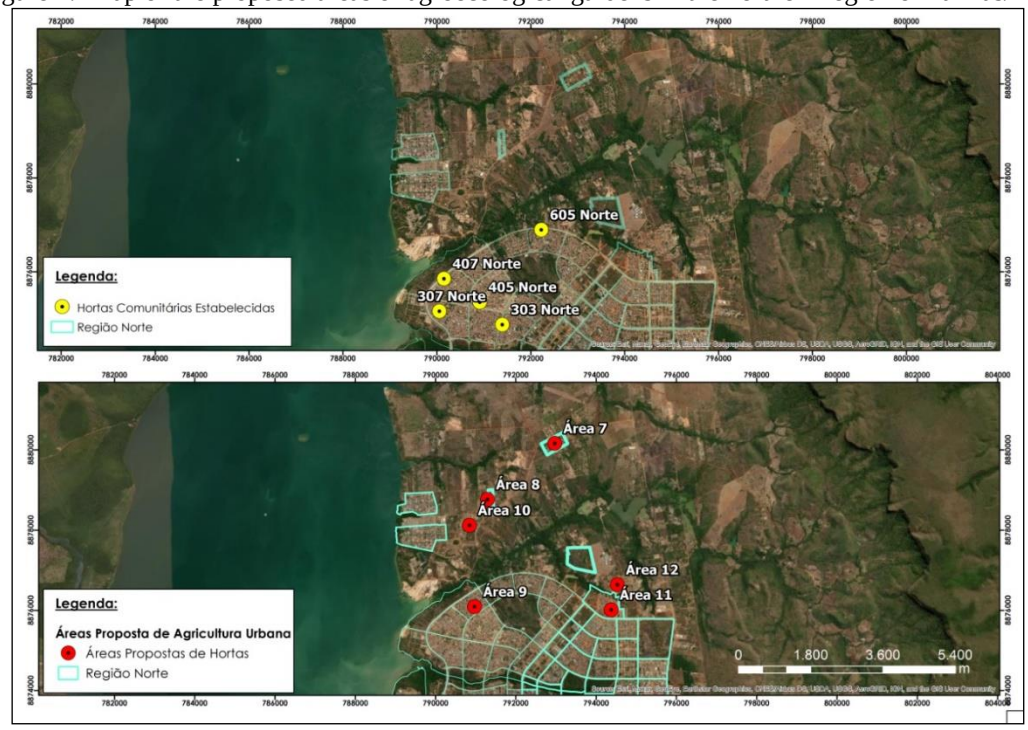
Figure 3. Map of the proposed areas of agroecological gardens in the southern region of Palmas /TO.



Source: Author (2021)

Figure 4 shows the 5 gardens in operation in the North region, and 6 areas of possible agroecological garden sites were indicated, located in the following blocks: Arno 44 (409 Norte), Setor Santo Amaro, Setor Lago Norte, Setor Água Fria, Setor Residencial Avalon and Setor Sonho Meu. The blocks are contained in the Plano Diretor of the city while the sectors are regions of settlements and territorial expansion composed of isolated urban allotments, conceived of a population largely of social and educational vulnerability.

Figure 4. Map of the proposed areas of agroecological gardens in the northern region of Palmas/TO.



Source: Author (2021)

It is verified that in the extreme north of the municipality of Palmas/TO, there is less presence of community gardens established by the Community Gardens Program of the municipality, in view of the lower population density of the sector. Among these, it is pertinent to highlight the advantages of urban agriculture such as: rational use of urban spaces, food security, human and local development, as well as promotion of environmental education and recreation (Roese, 2003).

They are residents who present precariousness in some indicators, such as the absence of asphalt paving of the roads and/or even sanitary sewage through the network, a high number of precarious housing some without internal sanitary conditions in a situation of greater socio-environmental vulnerability and less environmental perception in their environment.

7 PROJECT OF AGROECOLOGICAL VEGETABLE GARDENS

Given the context presented above, a proposal for a Project of Agroecological Urban Gardens was elaborated that it is an Environmental Education center that receives public schools and also provides courses for the community, for the benefit of human development and food security.

The proposal to implement an agroecological urban garden as a diffuser of environmental education aims to promote the environmental perception of children and adults, as well as transform the realities of vulnerable communities through the cultivation of vegetables and workshops focusing on environmental education. And become loco of the university's extension activities.

It is also important to highlight the debate on the establishment of community gardens to promote environmental education and awareness programmes, for example, since they are fundamental aspects towards a future society. Community gardens can be inserted in the process of education for the environment and citizenship, considering its multiple functionalities favorable to environmental education, so that they provide a rich environment for learning children and young people, and also involve adults, making it conducive to the development of environmental education actions and engagement with sustainable practices capable of raising awareness and mobilizing a community (BORGES, 2019).

It is worth emphasizing three important roles for the implementation of the Project: first - part of the public power through the burden of resource management; second – universities with commitment to teaching and extension providing environmental education for communities; and finally, third – community, with engagement of the mobilization of agroecological gardens.

Urban community gardens, as already mentioned, causes several changes in the well-being of the population, contributing to the improvement of food and health, together with this, offers several benefits such as increasing biodiversity and valuing local culture, besides enabling the involvement of people with sustainable practices, greater interaction with nature, coexistence and cooperation between people, these advantages allow the introduction of environmental education (CRIBB; CRIBB, 2009).

It is worth mentioning the importance of environmental education through the insertion of workshops with a focus on children, young people and adults, being a place of practical learning and can

receive visits from schools, in order to promote the development of themes focused on sustainability, workshops for planting seedlings, recycling, and urban cleaning, and where they can also perform sensory trail, and learn about medicinal herbs. It is significant for promoting environmental education partnerships with public and/or private universities through teaching and extension projects, offering knowledge and exchanges of experiences between universities and communities. Commitment and engagement are key factors for institutions to provide this fundamental support to the community.

It should be noted that urban actions that include the Agroecological Urban Gardens Project and environmental education drive the Sustainable Development Goal SOD 2 – Eradicating hunger, promoting the food and nutritional security of the vulnerable population, as well as sustainable agriculture. In addition, it enables the inclusion of people in cities through sustainable production and commercialization of products, contributing to the objectives of SDS 11 – Sustainable Cities. The agroecological garden project provides a place of learning to producers, as well as visitors with environmental education, being an opportunity for exchanges experiences and lessons, in order to contribute to the construction of citizenship in order to lead individuals to practice sustainability and sustainable development of the community.

8 FINAL CONSIDERATIONS

On the initial question of this work that the city of Palmas, capital of the State of Tocantins, planned to be the irradiator center of development of this State, can become an important food producer since there are several areas with this potential? It is understood that there is political will, because public policy already exists in the municipality with as an example the urban gardens some implemented 20 years ago, but urban agriculture goes far beyond the gardens already existing in the municipality.

And as for the objective of mapping public areas in the city of Palmas, Tocantins with the potential to develop projects of Agroecological Urban Agriculture and Environmental Education. The results showed a great presence of idle areas that can be used for the development of agroecological gardens, especially the most deprived regions. The twelve selected areas present communities with vulnerable people, lower levels of education and unemployed.

About the potential for agroecological urban agriculture projects in the study region. It is feasible that the Agroecological Gardens project incorporates environmental education for vulnerable communities in the municipality of Palmas/TO.

It is understood that the agroecological urban gardens project combined with the Environmental Education program offers for the most vulnerable population, income generation, food and nutritional security and better quality of life. Spaces that allow to awaken the valorization of care to the environment through environmental education workshops.

As mentioned earlier in the municipality of Palmas, only three sustainable development goals were achieved. Leal (2021) explains that there are major challenges for the rest of the sustainable development goals, especially in relation to SDGs 2- Eradicating hunger, SDGs 3 - Quality health, SDGs 4 - Quality

education, SDGs 5 – Gender Equality, SDGs 10 – Reducing inequalities, SDGs 16 – Peace, justice and effective institutions.

In this context,it should be mentioned the importance of community urban agriculture, with the role of mobilizing people in sustainable practices that promote the alleviation of these problems. What was observed about the Project of Hortas Urbanas Agroecológicas is that this project tipo directly meets and directly promotes two Sustainable Development Goals with eradication of hunger (SDGs 2) and sustainable cities (SDGs 11), strengthening Palmas/TO for the construction of a more sustainable, inclusive municipality, incorporated into the principles of sustainability.

It is worth remembering that the idle areas proposed in this work are suggestions of places for implementation of the Agroecological Gardens Project, thus, it is essential to support the public authorities with the availability of public areas and financial resources that promote the implementation of the proposed project.

In this sense, it is interesting to emphasize that this theme can be continued by new studies, and that it should begin with the willingness and positive attitudes of managers, academic community and local residents, because the implementation of the proposed actions will contribute to improving the quality of the urban environment and the sustainability of the city.

REFERENCES

ALTIERI, M. A.; NICHOLLS, C. I. **Agroecology and the reconstruction of a post-COVID-19 agriculture**. The Journal of Peasant Studies, v. 47, n. 5, p. 881-898, 2020.

ALTIERI, M. A.; NICHOLLS, C. I. **Urban Agroecology:** Designing Biodiverse, Productive and Resilient City Farms. AgroSur, 46, 49–60, 2018. DOI: 10.4206/agrosur.v46n2-07, 2018.

AQUINO, A. M. de; ASSIS, R. L. de. Agricultura Orgânica em áreas Urbanas e Periurbanas com base na Agroecologia. **Ambiente & Sociedade**, Campinas, v. 10, n. 1, p. 137-150, 2007. Disponível em: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1414-753X2007000100009. Acesso em: 13 de out de 2021.

BERNAL, A. MARTIINS, A. M. C. **Ministério do Meio Ambiente Programa de Educação Ambiental e Agricultura Familia**r: Caderno conceitual do PEAAF, Brasília: MMA, 2015, 64 p.

BORGES, I. N. **As Hortas Comunitárias Urbanas e Suas Contribuições para a Educação Ambiental e a Sustentabilidade: Compreensões e experiências dos usuários da Horta Comunitária do Guará – DF**. Monografia – Faculdade UnB Planaltina, Universidade de Brasília. Curso de Bacharelado em Gestão Ambiental, 2019.

BRANCO, M. C.; ALCÂNTARA, F. A. DE. Hortas urbanas e periurbanas: o que nos diz a literatura brasileira? **Horticultura Brasileira**, v. 29, n. 3, p. 421–428, jul./set. 2011. Disponível em: <http://www.scielo.br/pdf/hb/v29n3/v29n3a28.pdf>. Acesso em 29/08/2021.

BRASIL. Decreto n° 467, de 7 de fevereiro de 2018. Institui do Programa Nacional de Agricultura Urbana e Periurbana. **Diário Oficial**, Brasília, p.4, 9 ago. 2018.

BRASIL. Lei n. 9.795, de 27 de abril de 1999. Dispõe sobre a Educação Ambiental, institui a Política Nacional de Educação Ambiental e dá outras providências. Brasília: **Diário Oficial da União**, Brasília, DF, 27 abr. 1999.

BRITO, V. L. T.; MORAES, L. A.; MACHADO, R. R. B.; ARAÚJO, M. F. V. Importância da educação ambiental e meio ambiente na escola: uma percepção da realidade na Escola Municipal Comendador Cortez em Parnaíba (PI). **Revbea**, São Paulo, v. 11, n. 2, p. 22-42, 2016.

CAMILO, R. T. B., et al. Estratégias de educação ambiental para implantação de hortas orgânicas em espaços urbanos. **Conecte-se! Revista Interdisciplinar de Extensão**. V. 2. Nº 3. 2018.

CARMO, L. F. **Educação Ambiental e Agricultura Familiar Urbana em Juiz de Fora:** Para além da dicotomia Campo- Cidade. Dissertação (Mestrado). Universidade Federal de Juiz de Fora, Faculdade de Educação, 2019.

CARNEIRO, M. F. B., et al. Agricultura Urbana e Segurança Alimentar No Brasil: desafios e perspectivas. **Revista Desenvolvimento Social** No 19/01, 2016. (ISSN 2179-6807).

CLENDENNING, J., WH DRESSLER E C. RICHARDS. Justiça alimentar ou soberania alimentar? Compreendendo a ascensão dos movimentos alimentares urbanos nos EUA. **Agricultura e Humanos: Os valores** 33 (1): 165 - 77 . doi: 10.1007 / s10460-015-9625-8, 2016.

COMITRE, F. Sustentabilidade Urbana e Políticas Públicas: As Potencialidades Das Hortas Urbanas em Curitiba e Pinhais (PR). **Revista Mundi: Sociais e Humanidades.** Curitiba, PR, v.4, n.01, 42, jan/jul, 2019.

CRIBB, S. L. S. P.; CRIBB, A. Y. Agricultura Urbana: Alternativa para Aliviar a Fome e para a Educação Ambiental. In: CONGRESSO SOCIEDADE BRASILEIRA DE ECONOMIA ADMINISTRACAO E SOCIOLOGIA RURAL, 47, Porto Alegre, 2009. **Anais eletrônicos**. Porto Alegre: SBEASR, 2009. Disponível em: <https://ainfo.cnptia.embrapa.br/digital/bitstream/item/83763/1/2009-255.pdf>. Acesso em 28/08/2021.

EMBRAPA – EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA. **Marco referencial em agroecologia**. Brasília: Embrapa, 2006.

ESCRIBANO P. et al. **El papel de la economía informal en los proyectos agroecológicos durante el COVID-19**. Horiz. antropol., Porto Alegre, ano 26, n. 58, p. 437-461, set./dez. 2020.

FAO – FOOD AND AGRICULTURE ORGANIZATION. **The State of the World's Biodiversity for Food and Agriculture**. Rome: Commission on Genetic Resources for Food and Agriculture Assessments. FAO: 2019.

FAO – FOOD AND AGRICULTURE ORGANIZATION. The State of the World's Biodiversity for Food and Agriculture. Rome: Commission on Genetic Resources for Food and Agriculture Assessments. FAO, 2020.

FERNANDES, R., et al. Benefícios da implantação do programa hortas comunitárias em Maringá-Paraná. **Brazilian Journal of surgery and clinical research - BJSCR**, Maringá, V. 4, nº 1, p. 79-82, 2013. Disponível em: <http://www.mastereditora.com.br/periodico/20130731_225208.pdf>. Acesso em: 15 de mai de 2015.

FERREIRA, R. J.; CASTILHO, C. J. M. Agricultura urbana e gestão territorial em Recife/PE/Brasil: qual o lugar da agricultura urbana no planejamento da cidade? **Ateliê Geográfico**, Goiânia, v. 10, n. 2, p. 65-81, 2016.

FIGHERA, D. R. **A Efetividade do Projeto de Cidade Ecológica de Palmas – TO pelos seus espaços verdes**. Dissertação (Mestrado) – Universidade Federal do Tocantins, Curso de Pós-Graduação em Ciências do Ambiente, 2005.

FORSTER, T; HUSSEIN, K; MATTHEISEN E. **Sistema alimentares urbano - regionais: uma abordagem inclusiva e integrada para melhorar os sistemas alimentares e as ligações urbano – rurais.** RUAF Foundation Resoure Centres on Urban Agriculture & Food Security Revista de Agricultura Urbana n°29 – maio de 2015.

GLIESSMAN, S. R. **Agroecologia: processos ecológicos em agricultura sustentável**. Porto Alegre: UFRGS, 2000.

GRUPO QUATRO. Palmas - Memória da concepção. **Palmas: Prefeitura de Palmas**, 1989a.

HIRATA, A. C. S., et al. Caracterização da horticultura como uma estratégia de agricultura urbana em presidente prudente, estado de São Paulo. **Informações Econômicas**, SP, v.40, n.1, jan. 2010.

IBGE (Instituto Brasileiro de Geografia e Estatística). **Censo Demográfico 2010**. Disponível em: <http://www.cidades.ibge.gov.br/xtras/perfil.php?lang=&codmun=171190>. Acesso em 29/08/2021.

IPES-FOOD. 2020. **COVID-19 and the Crisis in Food Systems: Symptoms, Causes, and Potential Solutions.** Disponível em <http://www.ipes-food.org/_img/upload/files/COVID-19_CommuniqueEN.pdf> Acesso em: 20 de mai de 2020.

KRAN et al., **Qualidade de vida na cidade de Palmas - TO: uma análise através de indicadores habitacionais e ambientais urbanos.** Ambiente & Sociedade – Vol. IX nº. 2 jul./dez. 2006.

LEAL, V. A. **Território Do Jalapão:** Perspectivas e Desafios para a Implementação dos Objetivos de Desenvolvimento Sustentável. Dissertação (Mestrado) – Universidade Federal do Tocantins, Curso de Pós-Graduação em Desenvolvimento Regional, 2021.

LEROY, J.P.; PACHECO, T. **Dilemas de uma educação em tempos de crise**. In:. (orgs.).2. ed. São Paulo: Cortez, 2011.

LOKER, A. & FRANCIS, C. (2020) **Soberania alimentar urbana: necessidade urgente de agroecologia e pensamento sistêmico em um futuro pós-COVID-19, Agroecologia e Sistemas Alimentares Sustentáveis**, 44: 9, 1118-1123, DOI: 10.1080 / 21683565.2020.1775752.

MACHADO, A. T. e MACHADO, C. T. (2002) **Agricultura urbana**, Documentos Embrapa Cerrados, Planaltina, DF, 25 p.

MADUREIRA, H. **Paisagem Urbana e Desenvolvimento Sustentável:** apontamentos sobre uma estreita relação entre Geografia, Desenvolvimento Sustentável e forma urbana. X Colóquio Ibérico de Geografia. Évora, 2005.

MAXWELL, D. **A Importância da Agricultura Urbana na Alimentação e Nutrição**. Disponível em:<http://www.ruaf.org/reader> . Acesso em: 23 de jun. 2021.

MELO, L. P. **Os Benefícios da Agricultura Urbana e Periurbana para a Sustentabilidade da Cidade de Macapá-AP**. 7º Congresso Luso Brasileiro para o Planejamento Urbano, Regional, Integrado e Sustentável – Maceió, 2016.

MONTEIRO, A. V. V. M. Agricultura Urbana e PeriUrbana: questões e perspectivas. In: **Informações Econômicas**, São Paulo, v. 32, n. 6, p. 39-44, 2002. Disponível em: <http://www.iea.sp.gov.br/OUT/verTexto.php?codTexto=52>. Acesso em 04 de mai de 2021.

MOURA, J. A.; FERREIRA, W. R.; LARA, L. de B. L. S. Agricultura urbana e periurbana. **Mercator-Revista de Geografia da UFC**, v. 12, n. 27, 2013. Disponível em: <http://www.redalyc.org/html/2736/273628670005/>. Acesso em 13 de out de 2021.

NICHOLLS, C., ALTIERI, M., Vazquez, L. **Agroecology: Principles for the Conversion and Redesign of Farming Systems**. J Ecosys Ecograph S5: 010, 2016.

NÓBREGA, E. P.; SARMENTO, M. I. A.; OLIVEIRA, P. R. R.; HAFLE, O. M. Educação ambiental nas séries iniciais da Escola Municipal de Ensino Fundamental João Lopes da Silva – Município de São Francisco, Paraíba. **Cadernos de Ecologia**, v. 10, n. 3, 2015.

O'REILLY, E. M. **Agricultura Urbana** – Um Estudo de Caso do Projeto Hortas Cariocas em Manguinhos. Rio de Janeiro: UFRJ/Escola Politécnica, 2014.

PALMAS. Prefeitura Municipal de Palmas. **Decreto n° 284, de 22 de junho de 2012.** Secretaria municipal de governo Palmas/TO, 2012.

PALMAS. Prefeitura Municipal de Palmas. **Hortas comunitárias fomentam a agricultura familiar e promovem qualidade de vida a quem produz**. Secretaria de Desenvolvimento Rural – SEDER, Palmas, 2021.

PALMAS. Prefeitura Municipal de Palmas. **Hortas comunitárias unem moradores e geram renda de mais de R$ 155 mil.** Palmas, 2016. Disponível em:<https://bit.ly/2C8oweV>. Acesso em: 20 de mai de 2021.

PALMAS. Prefeitura Municipal de Palmas. **Lei Municipal n. 155 de 28 de dez, de 2007.** Do Plano Diretor Participativo do município de Palmas, 2007.

PALMAS. Prefeitura Municipal de Palmas. **Lei nº 1.011 de 04 de Junho de 2001.** Secretaria municipal de governo Palmas/TO, 2001.

PALMAS. Prefeitura Municipal de Palmas. **Relação dos endereços das hortas comunitárias**. Secretaria de Desenvolvimento Rural – SEDER, Palmas, 2020.

PERNA, D. **Educação ambiental e a química no curso de técnico em agricultura do Instituto Federal de Mato Grosso** – Campus Cáceres – MT. Seropédica, 2013. 65 p. Dissertação (Educação Agrícola). Instituto de Agronomia, UFRRJ, 2013.

RIBEIRO, S. M.; BÓGUS, C. M.; WATANABE, H. A. W.. Agricultura urbana agroecológica na perspectiva da promoção da saúde. **Saúde e Sociedade**, v. 24, p. 730-743, 2015. Disponível em: <http://www.periodicos.usp.br/sausoc/article/view/104846/103635Acesso em: 13 de out de 2021.

RIBEIRO, S. M.; *et al.* Agricultura Urbana Agroecológica: estratégia de promoção da saúde e segurança alimentar e nutricional. **Revista Brasileira em Promoção da Saúde**, v. 25, n. 3, p. 381-388, 2012. Disponível em: <https://periodicos.unifor.br/RBPS/article/view/2269> Acesso em: 13 de out de 2021.

ROESE, A. D. Agricultura urbana. **Embrapa Pantanal Corumbá**: Embrapa Pantanal, 2003.

SOUSA, R. P. O.; CALAÇA, M. Agricultura Urbana: uma nova alternativa para a produção de alimentos e melhor qualidade ambiental para a cidade. **Campo-Território**: revista de geografia agrária, v. 14, n. 32, p. 239-265, abr., 2019.

SOUSA, T. O. **Agricultura urbana e alimentação: análise das hortas urbanas na cidade de Palmas/TO**. Dissertação (Mestrado em Desenvolvimento Regional) – Universidade Federal do Tocantins – Campus Palmas, 2019.

ZEEUW, H.; GUINDEL, S.; WAIBEL, H. A Integração da Agricultura nas Políticas Urbanas. **Revista de Agricultura Urbana**, v.1, jul. 2000. Disponível em:<http://www.agriculturaurbana.org.br/RAU/AU1/AU1integracao.html>. Acesso em: 13 de out de 2021.