Sustainable food Production: a contribution of the field of architecture and urbanism

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This work is a synthesis of a degree thesis with sustainable design experience in Architecture and Urbanism at *Universidade de Fortaleza* (Ceará, Brazil). It aims to contribute with local sustainable development and well-being in a familiar cashew agriculture community (the Cooperative of Producers of Cashew and Familiar Farmers of Uruanan), located in the rural semiarid part of Fortaleza Metropolitan Area. The chosen building to be recovered by design is a workspace for cashew-based-food production.

Started by academic motivations and improved by participatory process from both the community and the local government, the research counted with five main methodological steps:1) literature survey based on Brazilian, French and American researchers about familiar agriculture, sustainable food production and politics for rural development; 2) selection of the agriculture community; 3) data collection; 4) site diagnose; and 5) design as an architectural practice. The selection of the agriculture community followed two main criteria: A) the community must be economically based on family farming; and B) the production building's farm must require architectural intervention towards sustainability. The primary data collection steps were, in macro-scale, to understand large site and cashew production and processing requirements, and in micro-scale, to identify local specific needs, to map and synthesize the data and then to take guidelines to an architectural project.

Finally, the thesis finished with the architectural design to cashew processing facilities. The proposal was presented to the community of farmers and later to local government, and it is, nowadays, a theme of discussions among them about the destinations for public policies and funding. At the end, we notice that this work contributes to economic, social and environmental pillars of sustainable development, and directly and indirectly to 8 of the 17 United Nations Sustainable Development Goals: SDG 1 - end poverty; SDG 6 - clean water and sanitation; SDG 8 - decent work and economic growth; SDG 10 - reduce inequalities; SDG 11 - sustainable cities and communities; SDG 12 - responsible consumption and production; SDG 15 - life on land; and SDG 17 - partnership for the goals.

The linkage between rural and urban

The beginning of the practice of agriculture (Neolithic Age) made it possible to the nomadic man to get established, starting the first permanent human settlements. This transition, known as the "Agricultural Revolution," represents a milestone in history as it led people to produce a surplus of the food supply. From this availability of food, other individuals could develop and specialize in different knowledge, enabling the emergence of manufacturing and other techniques and sciences. Therefore, the relation between man and farming changed from the need for production - considering the immediate livelihood - to commercial purposes. This transition expresses the first step of the change of farming villages into cities (Souza 1963, 42-46).

From then on, the beginning of cities in the ancient world also promoted changes in culture and politics, transforming the entire society (Souza 1963, 41-45). The non-producer population also resulted in the emergence of governors, officials, scientists, artisans, etc. In this context, the cities of ancient Greece (430 to 470 BC), developed a social structure based on the concept of the free citizen, giving rise to the idea of *pólis* as the ideal form of urban life, in which direct democracy represents the exercise of power (Mumford 1998, 178).

During history, urban life has been occurring in a very close connection to rural, sometimes in a relation of mutualism, or of urban dependency from food products. In the early nineteenth century, Europe faced the beginning of the Industrial Revolution, especially in Britain, France, and Germany (Choay 2018, 3), changing the pace of production and way of life. In rural areas, the use of machinery reduced the amount of labor needed, and cities became more attractive places: a symbol of opportunity and prosperity. These countries were the first to experience industrialization (Choay 2018, 3), and as a result, are among the first to address environmental and social problems caused by deruralization, ecological pollution and urban expansion.

This process occurred differently (slow and late) in several developing countries. Brazil, due to its typically agrarian structure, had relevant progress of industrialization only in the twentieth century, resulting in intense urban growth (Bruand 2010, 16-17). The impact was initially observed in the states where the largest metropolises were located, but gradually reached other regions.

In Ceará, a state located in the semiarid zone of Northeastern Brazil, industrialization occurred even later and on a smaller scale due its political, economic, and geographical limitations. The percentage of rural exodus and search for new opportunities in cities became more significant from the beginning of the 1960th decade as a consequence of the creation of the first industrial policies in Ceará (Filho 2014), which promoted the modernization and urbanization of Fortaleza[1], capital city of the State.

[1]Between 1900 and 1940, the demographic growth of Fortaleza from migrations was 55% (from 4,800 to 180,000 inhabitants) and 90% between 1960 and 1970 (Araújo and Carleial 2001, 9). In the urban environment, the consequences were the increase of precarious settlements and the inability of the local government to respond to the high demand for service and employment. Fortaleza was ranked as one of the most unequal cities in the world according to the United Nations Report on the State of the World's Cities 2010/2011 (UN-Habitat 2010, 95) and the seventh most violent in Brazil (BBC News Brasil 2018).

Environmental, economic and social development challenges partially explain the barriers to the sustainability of traditional agricultural families in the countryside, making it unattractive. Besides the fact that the city became more attractive, the rural exodus has also been motivated by region's long drought periods and by the farmers' understanding of the drought as a problem rather than a climatic condition that must be considered in the food production.

Another relevant aspect is the unequal distribution of rural land between large estates (*latifundia*) and the very few amount of small properties, which low profitability is not sufficient for the families well-living, especially those who are not landowners. Regarding the environmental issue, the absence of solid waste disposal and sewage treatment systems can promote serious groundwater contamination and nature pollution. It is also essential to highlight the possibility of food contamination and consequent difficulty of inserting the community's products into the consumer market.

This vulnerability position of rural communities is not the only responsible for creating those mentioned challenges. The rural-urban migrations contribute to urban demographic increase and do not guarantee improvement in the quality of life of these farming families in cities, as they usually undergo labor exploitation (cheap and unqualified jobs) and establish themselves in irregular settlements. In this process, the urban demand for education, health, and employment grow along with pollution, social inequality, and violence. Thus, unplanned urban growth and (unsustainable) development set in, impeding the provision of human rights to every citizen.

On the other hand, it is important to point out the dependence cities face on rural products. Urban areas do not have agriculture and livestock in its economic system, exceptionally in some specific urban farms like worldwide known Detroit's local food sales movement. These are the main sectors of any economy but usually urban population do not realize that the main human need is energy instead. Human being can only have it by means of rural products. In some cases, this urban dependence becomes very clear (figure 01).

In addition to this dependence of society on consumer goods, there is an economic dependence of urban workers on industry, as they need income to acquire purchasing power in the (capitalist) system in which we operate. For example, a person who would like to buy products free of pesticides or fertilizers will have to find a supplier who does so, that means that consumers depend on who produces their food. Likewise, the farmer who sells his products submits to the prices and conditions of prominent businesspeople because he has reduced market opening to sell the products.

At this point, it is relevant to emphasize the economic damage caused by large landowner production. It monopolizes the market with low prices for agricultural supplies due to their high productivity. In addition, the production of a single crop throughout the year and the use of chemicals promote soil impoverishment, environmental problems and can harm consumers' health. By contrast, the local demand for food without chemicals has increased along with the health concerns. However, this posture is not viable to the current large production structure because it directly reduces productivity, reaching consumers at high prices compared to the family farming production.

Figure 1 - News about a 2018 national truckers strike in highlight Brazil's urban society dependence on rural production.

Greve dos caminhoneiros e povo sem alimento: somos reféns do agronegócio

Há um desabastecimento de alimentos, morte de animais, uma crise sem precedentes em todas as esferas do sistema agroalimentar. Isso é culpa dos caminhoneiros que pararam?

(Midia Ninja 2018).

From this perspective, the agribusiness continues to develop using advanced techniques and artificial products while it becomes impossible for the traditional farmers to continue in the rural area. This structure contributes to the increase in social inequalities and poverty both in the countryside and in the city. To face the consequences of the deruralization, it is essential to implement improvements in farming communities to ensure the maintenance of traditional rural families in countryside, as follows.

The role of family farming to the sustainable development

According to Sousa, Khan, and Passos (2004), countries with better development rates have historically supported the family farming, which has been playing a fundamental role in establishing dynamic economies and democratic and equitable societies. Its significant contribution was mainly to enable a "socially balanced transition between rural-based enterprises to an urban and industrial economy" (Guanziroli 2009,15). Instead, in developing countries, rural life is strongly associated with precariousness and hardship, denoting "a human situation where survival is only possible with hard work" and offering only the minimum necessary to live (Sposito 2006, 23).

In this context, the creation of rural development strategies throughout the twentieth century in Brazil, especially in the military period (1964-1984), gave to agriculture a fundamental role to economic growth. The modernization of the latifundia in this period allowed "more efficient use of modern technologies (necessary to reduce food prices) and

a faster response to market" (Guanziroli 2009,16). The social role of agriculture, however, was not taken into account, negatively affecting income distribution and the balance of economic growth. As emphasized by Guanziroli (2009,16), the socioeconomic and political consequences of these strategies, along with a risen focus on investments in the industry (responsible for growth) and in the city (for development), resulting in the growing devaluation of the agriculture and the countryside. This has led to severe criticism from international organizations such as the World Bank. As Sousa, Khan, and Passos remarked:

> From 1990, the World Bank, through the World Development Report, made severe criticisms of the Brazilian agricultural development model. These criticisms were systematically elaborated in Report No. 1738 of May 27, 1993 (Sousa, Khan, and Passos 2004, 02).

Thus, by adopting an exclusionary socioeconomic model, Brazil reached the worst levels of human development among countries with the same level of *per capita* income and became, according to Guanziroli (2009, 17), a "paradigmatic case of unequal development". Given the negative results, the family farming debate has gained prominence in Brazil since the 1990s through the Ph.D. thesis of Ricardo Abramovay (*apud* Banco do Nordeste 2012, 9). Prior to this period, the terms used to designate the activity were: "small production, low income, subsistence production, non-commercial agriculture" (Abramovay and Piketty 2005, 57) These terms, in a way, usually characterize the way the segment was seen and treated:

> [...] socially relevant, but of marginal economic expression, and its future was already sealed by the very course of capitalist development, which would inevitably suppress such reminiscences of the past (Abramovay and Piketty 2005, 57).

In the institutional field, it is relevant to highlight the technical cooperation agreement signed in 1994 between the INCRA (Brazilian Institute for Colonization and Agrarian Reform) and the FAO (United Nations Food and Agriculture Organization). Even though this made family farming a strategy for sustainable development (Sousa, Khan, and Passos 2004, it was only through the Federal Law No. 11,326 of 2006 that the country came to have a national policy of family farming and rural family enterprises.

Throughout two decades of institutionalization and structuring public policies of family farming, the results regarding small agricultural production are positive. According to the Brazilian Ministry of Agrarian Development, World Bank and IBGE - Brazilian Institute of Geography and Statistics, in 2017 the country occupies the 5th place in the ranking of annual revenue from food production (US $ 84.6 billion), and of this total, 65% (US $ 55.2 billion) comes from family farming (Brasil 2018).

Today, the role of family farming is based on its social and economic importance. However, it faces significant challenges to become viable to the new economic dynamics, which is associated with technological advances and competitiveness, and has resulted in agribusiness growth and new forms of social and political organization. Thus, to help to overcome contemporary challenges, it is necessary to highlight the competitive advantages of family farming for any territory based on the three pillars of sustainable development.

Family farming stands out when compared to large enterprises production regarding workforce management (commitment and productivity), given its relevance in intensive production processes that require “delicate and careful cultural treatment”. In the large-scale system such care is hardly present and, even if there were higher wages, it is difficult for the worker to “get the same commitment and productivity achieved by a working family for himself” (Guanziroli 2009,6).

Through an analysis of the total income and gross value of agriculture in Brazil, Buainain, Romeiro, and Guanziroli (2003) compared family and employer agricultural initiatives. They observed that “even though they own less land and funding, [family members] produce and employ more than the enterprises” [emphasis added] as “they use productive resources more efficiently” (Bauinain, Romeiro, and Guanziroli 2003, 320), thus contributing to a large share of the country's agricultural revenues. This fact partly justifies the data of 65% of Brazil's annual food production revenues come from family farming (Brasil 2018).

Another competitive advantage of family farming for sustainable development is the small farmer's quality of life. Ploeg (2016) analyzes this issue from recent European experiences, using as criteria for qualitative analysis the perception of rural work itself about the feelings of “hardness” and “utility”. Regarding the feeling of hardship or discomfort at work, the author notes that “some [family] farmers mention the outdoor work, highly diversified tasks, independence and nature work as the most attractive aspects of their work” [emphasis added] (Ploeg 2016, 158). By contrast, for those who work in agricultural companies, the work is perceived as monotonous, being described by them as more “painful”.

Nonetheless, family farming also stands out in the environmental field when compared to large-scale production. On the other hand, agro-enterprises search for high productivity and adheres to technology and the "green revolution", a posture of direct and uncritical use of "selected varieties, agrochemicals, and water" (Guanziroli 2009, 19). These chemicals (pesticides, fertilizers, preservatives, among others), despite the productive advantages, when used irresponsibly, can promote various kinds of environmental pollution and imbalance the ecosystem, potentially affecting the health of consumers.

Yet concerning the environmental aspect, the permanence of famers in the countryside and continuation of the practice of agriculture helps the ecological preservation. According to Amouretti (1994, 77), the more the land is exploited by agricultural production, the better the soil is preserved. This fact is due to the capacity of the vegetation to retain 30% of rainwater, “avoiding siltation of watersheds, lakes, dams” (Mendes 2007, 63).

In the Brazilian semiarid region, where the drought is a normal environmental condition, agriculture has relevant role in balancing the environment and preserving “riparian forests or galleries from river sources to their basin, as well as in the lakes and dams, since the vegetation regulates the hydrological cycle and the rains ”(Mendes 2007, 63).

Ceará is the state of the Brazilian semiarid most affected by drought due to the absence of a humid coastal zone, promoting a direct transition between the desert and the *Caatinga* with the ocean. In this context, the difficulties faced by family farmers are diverse and are related, *a priori,* to the natural aspects associated with their bio-physical forms. However, it is worth highlighting the external elements that intensify such difficulties, associated with

the historical process of land occupation and its consequent structural disadvantages to the socioeconomic balance (Guanziroli 2009, 06).

Thus, taken the understanding that several aspects explain the precariousness of rural areas in northeastern Brazil, the drought itself is not a reason for land abandonment; instead, knowing how to deal with the semiarid as a cultivation area is a significant factor of survival and permanence. Family farming[2] is a crucial point for the sustainable development of any region, and Ceará still faces major obstacles in this area.

Rural Development: A brief review of food production and national policies in Brazil

Both in Brazil and other developing countries, rural life is often associated with precariousness and difficulties. Regarding food production, even with the advantages listed, there is still a profound devaluation of small production. In contrast, large corporate production is placed as the engine of development and, consequently, the place for investments.

For a long time, the idea of development was related to its economic growth, while the concept of sustainability was more associated with the ecological issue of environmental protection. However, with the advances of the debates, the notion of sustainability has expanded, including the ability to sustain or to remain balanced in three pillars: economic, environmental, and social. Thus, the concept of sustainable development[3] emerged from the understanding that economic development alone would not be sufficient to guarantee the continuity of people's quality of life (Tavares 2009, 33). For the author, sustainability will only be achieved if established in all countries, and if it is for all individuals. The principles of sustainable development are social justice (mainly related to poverty and gender equality), concern for future generations and community participation (Blewit 2008a *apud* Hopper 2012, 219).

Concerning agriculture, the goal of development was to attain self-sufficiency, an agricultural model that was consolidated in much of the market-oriented world. This model is known by limitless production and non-concern about environmental impacts, ignoring the most fundamental advantages of sustainability in agriculture: “setting a larger population contingent in the countryside, generating employment, income and thus contributing to the fight against hunger”(Tavares 2009, 49).

Given these points, it is necessary to implement a different technological standard from the current one, combining socioeconomic and socioecological interests, configuring a new model of “integrated agriculture” (Tavares 2009, 48). Thus, to achieve sustainability in agriculture, it is necessary to:

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[2] Family farming encompasses all family farming activities, relating to many aspects of rural development. Family farming makes it possible to organize agricultural, forestry, fishery, pastoral, or aquaculture production which, under the management of a family, depends mainly on the family work of both men and women [our translation] (FAO 2018).

[3] In 1987, through the publication of the Report “Our Common Future” by the United Nations World Commission on Environment and Development, the definition of Sustainable Development officially went public, and was considered the “development that meets current needs without compromising future generations' ability to meet their own needs ”(UN 2018).

> the establishment of a new production standard that promotes social inclusion; provides better economic conditions for farmers; produces food free of chemical residues; do not degrade the environment; and maintains the characteristics of agrosystems for extended periods (Tavares 2009, 48).

Therefore, throughout the twentieth century, the central countries of Europe did not only implement agricultural policies to achieve self-sufficiency but also integrated policies between production, land management and environmental issues (Bazin 1996 *apud* Tavares 2009, 50). Such experiences lead us to reflect on the need to push Brazilian society on these issues to reverse its colonial heritage and contribute to its sustainable development.

According to Guanziroli, Romeiro, and Buainain (2009,150), about half of the families in the Northeast live in critical poverty, and more than 12 million in rural areas. This contingent represents "63% of the country's rural poverty". Additionally, the data from the IBGE 2010 collected by the Banco do Nordeste (2012, 7), show that the Northeast small producers make up 50.1% of the total family establishments in Brazil, occupying 35.3% of its territory. Nevertheless, "the total amount of financing for family farmers in this region is lower than those in the South and Southeast" (IBGE 2010 *apud* Banco do Nordeste 2012, 7).

It is relevant to mention that the first significant step towards establishing public policies to strengthen family farming began in 1995 with the creation of the National Program for Strengthening Family Farming (Pronaf) during the Fernando Henrique Cardoso government. In 1996 and 1997, respectively, credit and investment actions were initiated in the sector (Schineider, Cazella and Mattei 2004 *apud* Banco do Nordeste 2012, 13). Another critical moment in this process was the creation of the National Policy on Family Farming and Rural Family Enterprises, Law No. 11,326, of July 24, 2006, which recognized family farming “as a productive segment to be addressed by public policies ” (Sousa 2009 *apud* Banco do Nordeste 2012,13).

Currently, there are national and public bodies[4], that enabled greater control, monitoring, and implementing policies aimed at family farming. It was in this context of integration of actions and programs that the "Family Farming Crop Plan[5]" was created, setting a strategic plan for the strengthening of family agriculture. Finally, the need for agrarian

[4] Among national and regional bodies there are: the Special Secretariat for Agriculture and Agrarian Development (SEAD), the Ministry of Social Development (MDS), the National Institute for Colonization and Agrarian Reform (INCRA); National Department of Drought Works (DENOCS), the Brazilian Agricultural Research Corporation (EMBRAPA); the Institute of Agrarian Development of Ceará (IDACE), in the case of Ceará; The Northeast Bank of Brazil (BNB), among others.

[5] The 2017/2020 Crop Plan (SDA 2017, 13) includes 10 axes of actions and programs for the implementation of "policies for individual promotion (productive inclusion projects); technological innovation; commercialization; water supply projects; animal feed, with the distribution of forage palm (vegetable resistant to dry climate and used to feed the herds); rural credit; Guarantee-Vintage and production insurance". They are: 1) Pronaf; 2) National Land Credit Program (PNCF); 3) Land Regularization; 4) Regulation of the Family Farming Law; 5) Organic Agriculture and Agroecology; 6) Support for Productive Modernization; 7) Marketing; 8) Technical Assistance and Rural Extension (Ater); 9) Urban and Periurban Agriculture; 10) Integrated Actions in the Semiarid.

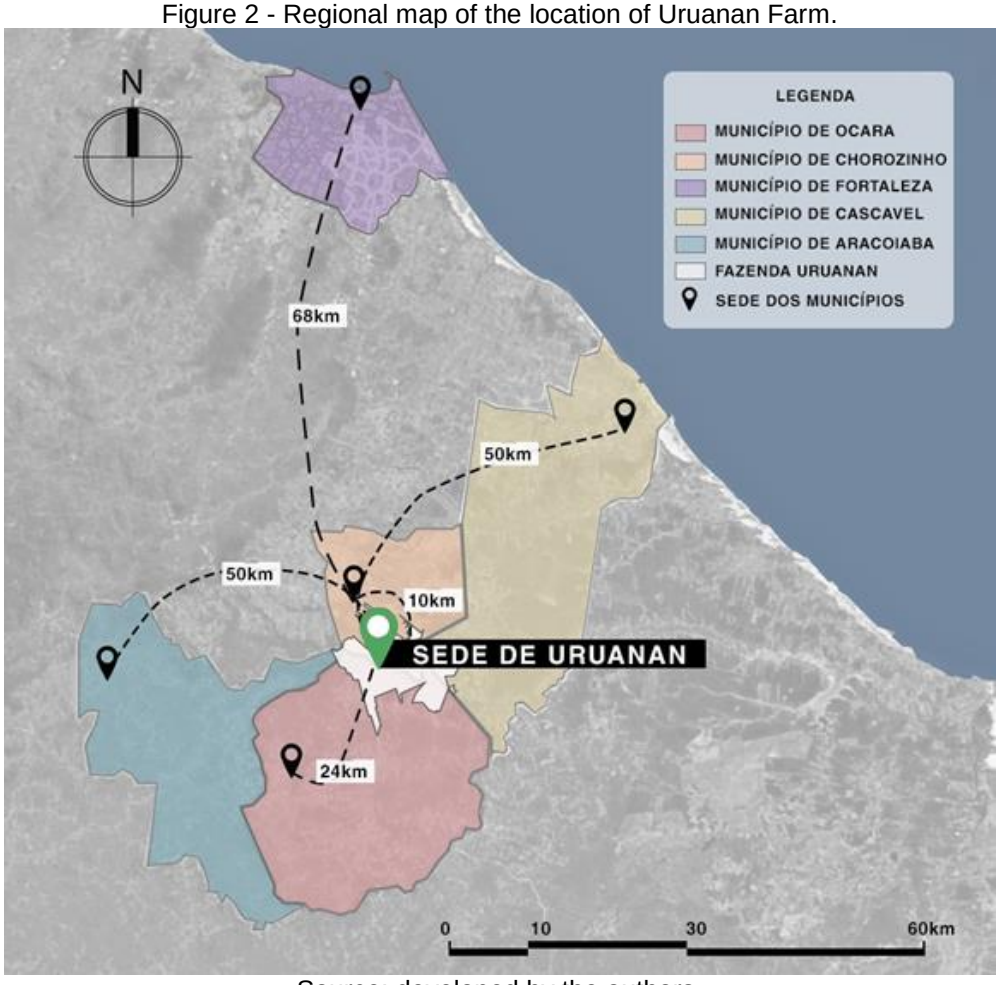
policies, especially aimed at the small semi-arid producer, has resulted in the creation of different agencies and programs towards rural people and resisting drought.

However, they still represent a small portion of the national achievements and programs needed for sustainable development. It is also worth mentioning that none of the policies or programs designed deals with the practice of architecture as a mechanism to contribute to sustainable development in rural areas. Even though this issue is being underestimated by public policies and insufficiently researched, this paper follows analyzing the participatory design process developed in Ceará.

The context of Uruanan (data and diagnostic)

The center of Uruanan Farm is located 10km from the urban area of the municipality of Chorozinho, in Metropolitan Area of Fortaleza (Figure 2). The economy of the region is marked by the advance of industrialization but is still strongly linked to agriculture: Chorozinho by cashew production and the neighboring municipalities (Cascavel and Ocara) by banana and guava. Although they already face problems as a result of the developing industrial activity and urbanization, and issues of land and infrastructure, most households are still economically dependent on agriculture (Figure 3).

Figure 2 - Regional map of the location of Uruanan Farm.



Source: developed by the authors.

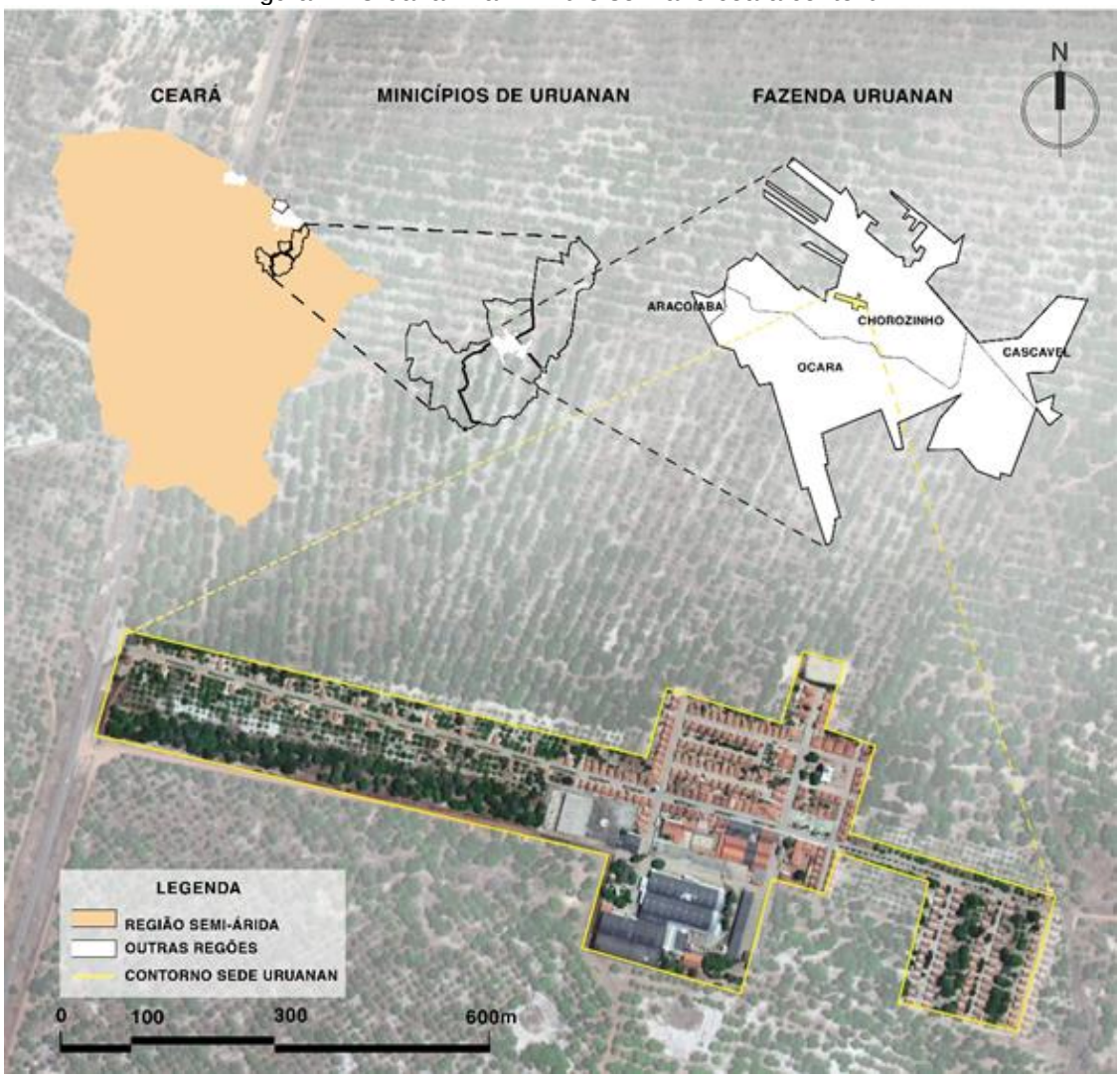
Figure 3 - Challenge in rural Ceará.

Source: author's archive.

The emergence of the community dates the creation of Uruanan Farm by the Northeast Oils Industrial Company - CIONE, an important national cashew export industry (CIONE 2018). Jaime Aquino (1924-2015), founder and owner of CIONE, started his business as a truck driver, traveling around the country transporting cashew and its derivatives. 50 years later, in 1962, Aquino founded CIONE its properties reached 170 thousand hectares (Folha de São Paulo 2018) and started to export 90% of its production (CIONE 2018). Of these, 50 thousand hectares are for cashew cultivation in Piauí and in Ceará, in the region between Chorozinho, Ocara, Cascavel, Aracoiaba (Figure 4), which gave rise to Uruanan Farm and later to the referred agricultural community.

After Aquino's death in 2015 (without heirs), the company ended the farm activities. Despite this, the population of farmers at Uruanan continued to grow, having the cashew culture as the primary source of income. In this context, Ceará State Government sought solutions to benefit the farmers, solving the land issues to guarantee their permanence. Thus, through Decree No. 31,945 of May 3, 2016, the Government created the Uruanan Project - Pirangi Reformed Area, a strategy for sustainable and solidary development. The Government also expropriated social areas, such as streets, squares, church, school, a few houses, which will become a public health and culture facilities.

Figura 4 - Uruanan Farm in the semiarid ceará context.

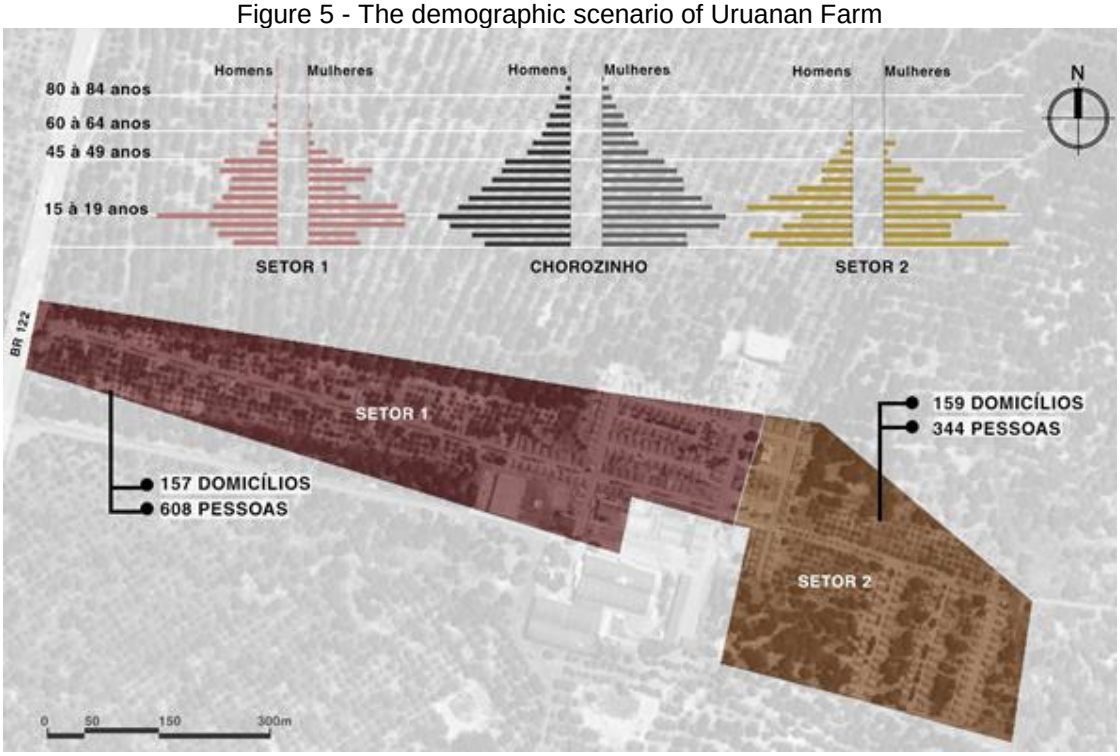


Source: developed but the authors.

It is worth to mention that the concept of “reformed area” incorporates the idea of associationism and cooperativism, and Uruanan residents have embraced the proposal. In 2016, Uruanan family farmers grouped into 17 associations and formed a single cooperative. In this process, the Cooperative acquired some spaces for future activity.

To identify and understand the contributions the field of architectural could promote, a data analysis was necessary. The demographic context confirm the researches about rural-urban migration (as the elder, the fewer people live in the center of Uruanan Farm), highlighting the importance of providing ways of permanence (Figure 5).

Figure 5 - The demographic scenario of Uruanan Farm



Source: developed by the authors.

Related do education, although the infrastructure issues, schools and public transportation indeed exist. Concerning public health services, there were identified four organizations of public services nearby the area. Despite this scenario of limitations observed through these and other aspects (environmental sanitation, energy, telecommunications; culture, sport, leisure and religiosity, and climate), the seasonality of the cashew crop (Augustus-November) and the exploitation from the “middlemen” were pointed by the farmers as the most critical challenges.

During the off-season, many migrate for survival and go to bigger cities as the capital Fortaleza. In addition, the analysis on poverty data along with discussions with Ceará State Government highlighted their urgent need for economic development: Uruanan’s farmers get approximately $0.69/kg of cashew nut (in the shell) when selling through the “middlemen”. By contrast, in Fortaleza the nut costs approximately $17,35/kg.

Besides the economic issue, an environmental problem also stood out: taken the lack of infrastructure to work with perishable food, the farmers discharge the cashew apple in nature and only collect the nut (Figure 6). In this sense, being able to store the cashew would allow them to continued to acquire income (during the entire year) and to diversify the products by producing cashew derivate. Thus, it would create a pathway for them to remain in the countryside.

Figure 6 - food discharge: an environmental and economic harm.

Source: author's archive.

Thus, it is observed that the challenges, mainly land access, represent a barrier to the decent life of family farmers, but with the help of the State Government, important steps have already been taken. However, even with medium and long-term plans, communities have short-term needs, especially regarding the structuring of productive spaces to allow their survival during the time of implementation of government actions.

Therefore, this diagnostics led the decision to elaborate an architectural project for underused buildings in Uruanan Farm with the objective of resuming cashew processing activities, providing other development opportunities besides the commercialization of cashews.

Architectural Project

The architectural practice to be presented aims to stimulate the discussion of the role of the field of architecture and urbanism to effectively contribute to development in human settlements, both in urban and rural areas. Facing these facts, two critical understandings must be changed. The first deals with rediscovering the scope of its practice and bringing back a holistic perspective, while the second relies on turning over the image of the linkage between rural and urban; it means to understand that a) the city rises from the rural production and not the inverse, and that b) it is not a relation of dependence but complementation.

Thus, considering the context of Uruanan Farm, the potential of the unused buildings to be transformed into workspace of the family farmers of Cooperative led to the development of this project. The buildings were analyzed considering its structure, comfort (lightning and ventilation), size of spaces, and the dynamics of the future productive activity (Figures 7-10).

Figures 7, 8, 9 and 10 - Architectural analysis of the unused buildings.

Source: author's archive.

The concept of sustainable development expresses in the architectural design of the Uruanan Cashew Farmers and Family Farmers Cooperative (COOPCAF) through three strategies: reuse of existing building structures and equipment; management and use of resources and waste; and use of biophilic elements.

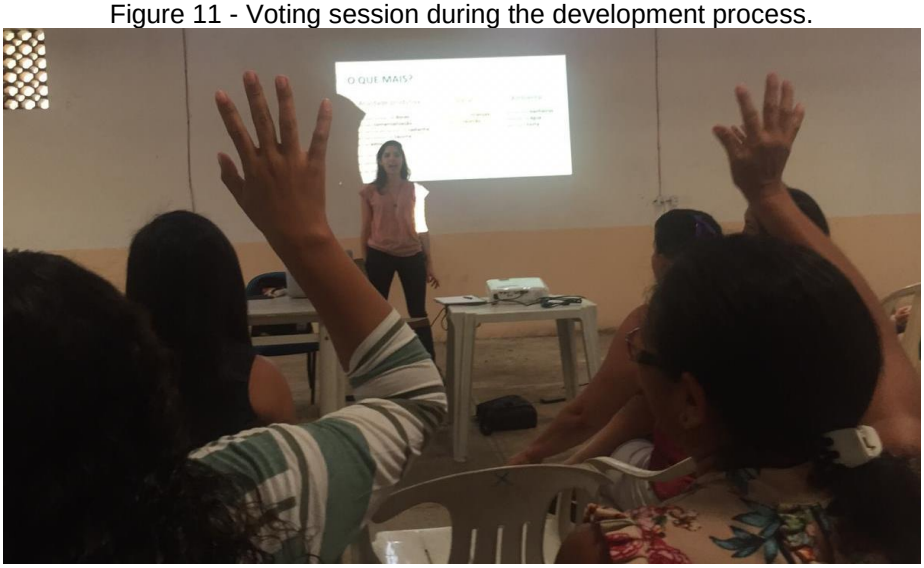
The use of building structures and equipment is based on the idea of preserving their local (historical) identity, making the implementation of the project more financially affordable and reducing the waste of the construction. It is worth mentioning that his strategy considers the reuse of the construction waste to the paving.

The management and use of resources and waste has the goal of dealing with the climate condition (semiarid) and the drought and using natural resources to produce energy. Thus, this strategy includes the use of solar panels and low impact engineering, such as biodigestor and waste composting plants.

The use of biophilic elements deal with assuring the connection the farms have with nature will not be untied by the production processes (and its walls). The use of plants also contribute the food production and the landscape, besides preserving the environment.

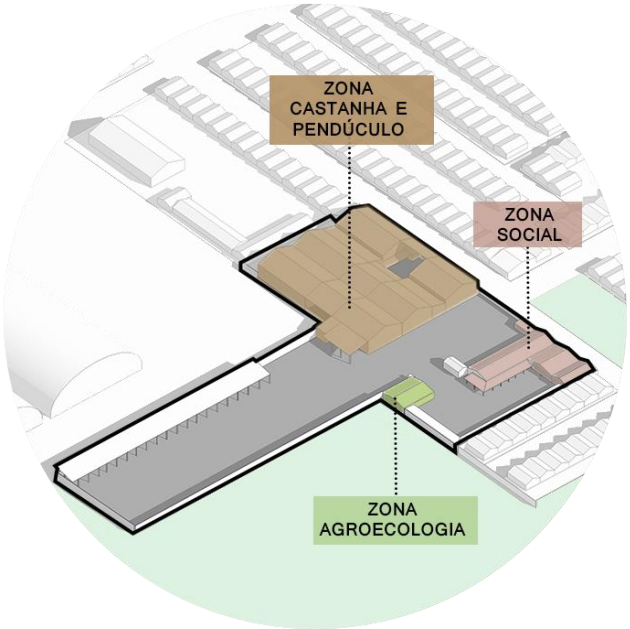
The project was discussed with the family farmers during the entire development to better respond to their demands, not only on the food production scale but also on the community (Figure 11).Therefore, the project was designed considering three main sector: production, social and innovations on agroecology (Figure 12).

Figure 11 - Voting session during the development process.



Source: personal archive.

Figure 12 - Diagram of the three sectors.



Source: developed by the authors.

Considering this work was developed with academic purposes, after approval by the academic examination body, the architecture proposal was presented to the community and its direction board. Through diagrams of the production process, plans and illustrative images (Figures 13-19), the community was able to understand the project and discuss. After the farmers' approval, the technical project (plans, sections, etc.) were presented to the Ceará State Government (Figure 20).

Figure 13 - Social sector: library

Source: developed by the author.

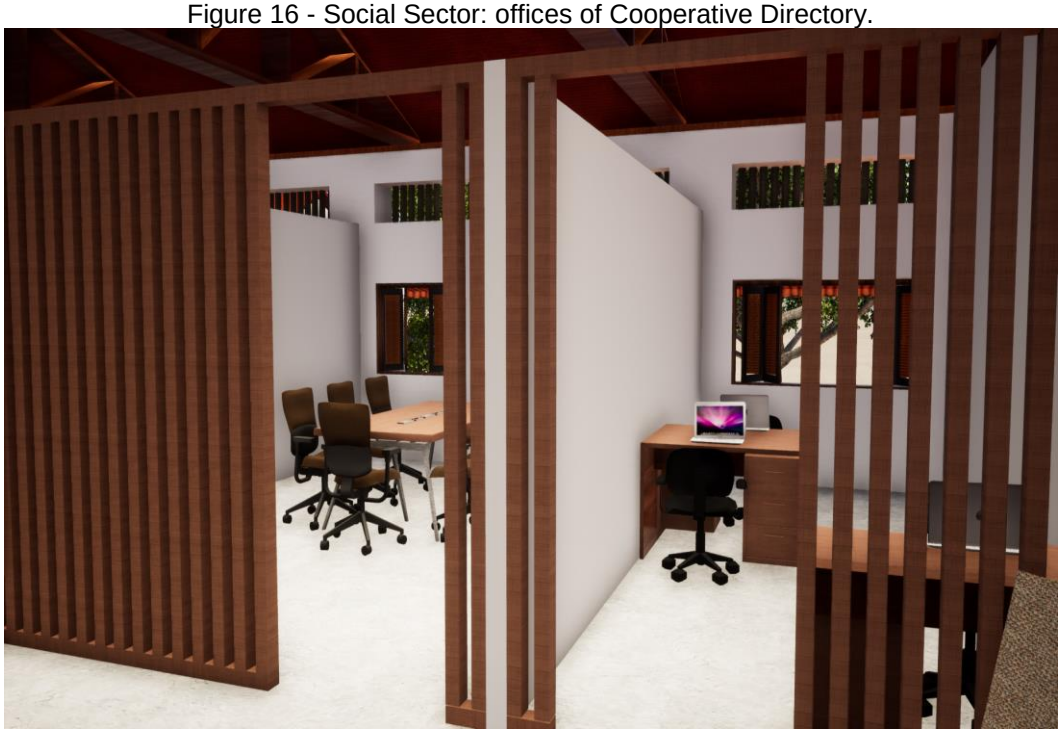
Figure 14 – Production Sector

Source: developed by the author.

Figure 15 - Production sector: eating cort.

Source: developed by the author.

Figure 16 - Social Sector: offices of Cooperative Directory.



Source: developed by the author.

Figure 17 - Open space between Production and Social.

Source: developed by the author.

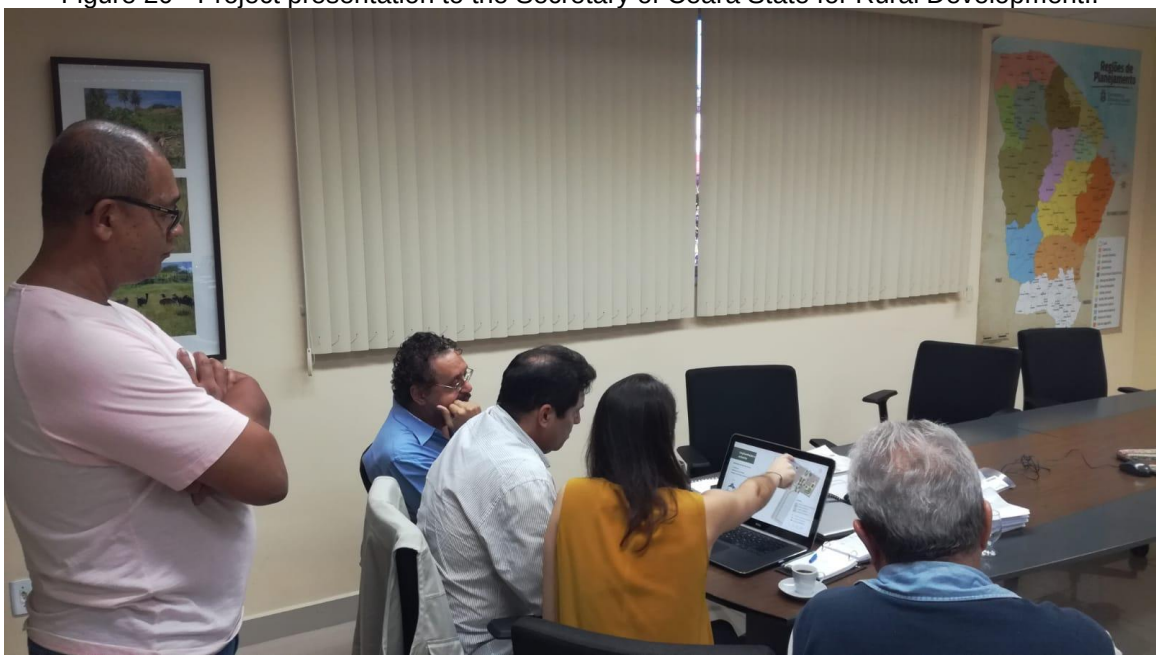
Figure 18 - Connection between Production and Agroecology Sectors.

Source: developed by the author.

Figure 19 - Perspective from above.

Source: developed by the author.

Figure 20 - Project presentation to the Secretary of Ceará State for Rural Development..



Source: personal archive.

The presented study of contributions that architecture and urbanism can make to the food production in rural communities obtained satisfactory results. The project opened the discussion about the holistic character of the sustainable development and the need of a multidisciplinary team. Besides that, Uruanan Farm (the community case of study) got empowered throughout the process and the farmers are mobilizing to make the project be build. At this point, it is clear the contributions of this work, however it represents only the beginning of the debate and reaches.

Note

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