IOSR Journal of Business and Management (IOSR-JBM)
e-ISSN:2278-487X, p-ISSN: 2319-7668. Volume 26, Issue 11. Ser. 13 (November. 2024), PP 58-70
www.iosrjournals.org

Agroecology Practices Applied To Cotton Culture In The Scope Of Family Farming

Elijalma Augusto Beserra, Maria Jaciane De Almeida Campelo, Maria Augusta Maia E Souza Beserra, Emily Vitoria Maia E Souza Beserra, Tânia Maria Sarmento Da Silva, Eva Mônica Sarmento Da Silva

Doutorando. Companhia De Desenvolvimento Dos Vale Do São Francisco E Parnaíba - Codevasf, Programa De Pós-Graduação Em Agroecologia E Desenvolvimento Territorial - Ppgadt, Universidade Federal Do Vale Do São Francisco – Univasf, Petrolina – Pe.
Doutora. Docente. Colegiado De Engenharia Agronômica, Universidade Federal Do Vale Do São Francisco – Univasf, Petrolina – Pe.
Graduanda. Colegiado De Medicina, Campus Paulo Afonso/Ba, Universidade Federal Do Vale Do São Francisco – Univasf, Paulo Afonso/Ba.
Graduanda. Colegiado De Medicina, Departamento De Medicina, Faculdade De Petrolina – Facape, Recife – Pe.
Doutora. Docente. Departamento De Química,Universidade Federal Rural De Pernambuco – Ufrpe, Recife – Pe.
Doutora. Docente. Colegiado De Zootecnia, Universidade Federal Do Vale Do São Francisco – Univasf, Petrolina – Pe.

Abstract
The present study was developed at Projetos de Settlement (PA) Né Laranjeira, located in the Rural Area of Parnamirim, a municipality belonging to the development region of the central Sertão of the state of Pernambuco. The data collection procedures were carried out between March and May 2022, and aimed to describe the state of structuring of family agroecosystems of production implemented in the community through actions promoted by Non-Governmental Organizations (NGOs) such as Diaconia , Dom Helder Câmara and the Caatinga, which resulted in the production, in an agroecological way, of food products as well as organic cotton (Gossypium hirsutum L.), guaranteeing the food and economic security of the settlers. Therefore, a descriptive, qualitative research was developed, during which production techniques and management were identified, as well as the difficulties faced by the community in the application of protocols and consolidation of systems. It was possible to identify that the form of production implemented in the settlement provides the sustainability of agroecosystems that are committed to the principles that govern the program and that the results obtained have allowed other producers to join the project, even with the difficulties of access to education, health, credit and official public policies in addition to family succession that has limited the family's ability to work.

Keywords: S*emiarid; Settlement Project; Agrosystem; Food Sovereignty.*

Date of Submission: 29-11-2024 Date of Acceptance: 09-12-2024

I. Introduction

If there is an axiom that serves as a general rule accepted by the vast majority of scholars of social relationship processes, it is the idea that there are no easy solutions to complex issues. This premise fits like a glove when we refer to the process of convention, to the philosophical principles that guide agroecology, in other words, to the agroecological transition process. It was with this perception that Tittonell (2019) stated that his understanding of the process of transitioning from conventional production to a food production system classified as sustainable, emancipatory, and rooted in the principles of agroecology, due to being a complex economic and socio-environmental process, would possibly not occur in a unique or standardized manner. On the contrary, this path would be composed of numerous routes, some short, others long, but to detail the level of complexity of the transition process, it could occur simultaneously, and depending on the region, in "scales, levels, and dimensions; social, biological, economic, cultural, institutional, political distinct" (TITTONELL, 2019, p. 231). 231).

Unlike the production processes adopted by conventional agriculture, agroecology, as taught by Macrae et al. (1990), cannot be understood merely as a production practice that can be replicated in different regions or societies. Time and experience have shown that agroecology is a philosophy of life (CAPORAL et al., 2010, p. 95) that involves the way and the procedure by which producers relate to nature, the environment, and other members of their society. As it could not be otherwise, this way of acting, thinking, and proceeding ends up being reflected in the productive cultivation systems, considering that practicing agroecology is literally a set of attitudes

and positions founded on socio-environmental values that portray the identity of the group (BOURDIEU, 1996, p. 108) and the level of awareness of the ecological, economic, and social realities of individuals in the face of a set of principled concepts and doctrines that are constructed over time.

It is this level of agroecological identity that the most attentive researcher can perceive and extract during even a brief interaction with the rural workers of the Settlement Project (PA) Né Laranjeira, one of the 12 settlements established by the National Institute of Colonization and Agrarian Reform (INCRA) in the territory of the municipality of Parnamirim, State of Pernambuco. This rural production unit, according to memorandums provided by INCRA (2022), was created on October 29, 2007, having been registered under nº MF0247000, occupying an area of 664.6824 ha that belonged to Fazenda Dourado (INCRA, 2021, p. 37).

As described by Barbosa (2003), the northeastern semi-arid region is characterized by its climatic, social, political, environmental, and geographical idiosyncrasies, which attribute to its uniqueness among other semi-arid regions in the world. The ecological diversity that inhabits the spaces and natural environments of the region, which constitutes the Caatinga biome, when associated with dense occupation and a low human development index in rural areas (BARBOSA, 2003, p. 27) and limited industrialization of urban centers, creates an environment conducive to the perpetuation of a condition of deprivation that culminates in the poverty situation that afflicts a large portion of the inhabitants of this space, especially those parts of the population that reside in peri-urban areas and rural communities.

In this space, 44 (forty-four) families of smallholder farmers have been settled, who currently engage in agricultural activities with a focus on sustainable and participatory agriculture. This option is relevant to the community as the PA Né Laranjeiras is located in the rural area of a municipality belonging to the microregion of Salgueiro, Development Region (RD) of the Central Sertão (CONDEPE/FIDEM, 2018, p. 03). Region that, according to the teachings of Albuquerque (2020), is nestled in the semi-arid region of the state of Pernambuco, an Area Susceptible to Desertification (ASD), as are considered "90.68% of the territory of Pernambuco, given that they present a considerable risk related to the process of desertification increasing" (ALBUQUERQUE, 2020, p. 683).

Notwithstanding the institutions from different sectors of society conducting studies on ways to address this desertification process in the state, it is true that since 1999, the state of Pernambuco has adopted a State Policy for Desertification Control, having even implemented units to combat desertification in the Pernambuco semi-arid region in municipalities such as Parnamirim, Cabrobó, Serrita, and Verdejante, the truth is that the northeastern semi-arid region has climatic characteristics that cannot be neglected in the way we deal with the environment, among which the average annual precipitation index of less than 800 mm stands out, with rainfall levels varying in time and space, and concentrated in 4 or at most 5 months, factors that cause a water imbalance in the system (SANTIAGO et al., 2013).

In these scenarios, more specifically at the UTM coordinates of latitude 395386.40 m E and longitude 9089850.53 m S, the residents of the PA have implemented productive units where cotton (*Gossypium hirsutum L.*), pigeon pea (*Cajanus cajan L.*), cowpea (*Vigna unguiculata*), sesame (*Sesamum indicum L.*), sunflower (*Helianthus annuus*), corn (*Zea mays*), peanut (*Arachis hypogea L.*), and jack bean (*Canavalia ensiformes*) are produced agroecologically, in addition to forage such as prickly pear (*Opuntia ficus-indica*), gliricidia (*Gliricidia sepium*), and leucaena (*Leucaena*), considering that in this system the technique of integrating plants, animals, and bees is employed.

Barbosa (2003) is quite precise in highlighting that agroecology in the Northeastern semi-arid region has enabled the construction of a culture of coexistence with the typical climatic issues of this caatinga region, and why not say, foster a sense of respect for the semi-arid region (BARBOSA, 2003, p. 30). This agroecological way of interacting with the environment promotes the recovery of natural spaces and the coexistence of agricultural crops with native plants, through the use of techniques and rural extension that are environmentally committed and socially liberating.

From this perspective, NGOs and educational institutions have assumed a decisive role, as was the case with the Articulação do Semi-Árido (ASA) during the implementation of the P1MC program, which proposed the construction of one million cisterns (BARBOSA, 2003, p. 27) in rural communities lacking potable water, later followed by production cisterns and productive gardens. These actions aimed at Sustainable Local Development (DLS) were successful examples of programs promoted by entities associated with the Integrated and Sustainable Local Development Network (Dlis), which saw agroecology as a way to meet the principles proposed by Agenda 21, especially regarding food sovereignty (BARBOSA, 2003, p. 28).

It was within this community that the studies were developed, which served as the basis for the preparation of this scientific work that adopted the methodology of conducting participatory field visits, during which data collection was carried out with the producers who make up the PA Né Laranjeira community.

II. Material And Methods

Since it is a community of agrarian reform settlers, the local leadership was initially presented with the foundations that guided the implementation of the research project, as well as the importance for the community of conducting this type of study with the settlement's products, to the extent that the publication of the research results would publicize the group's history of struggle, as well as their products, which would be presented to the scientific and academic community. Another positive aspect of participating in the study would be the opportunity to give other rural producers the sense that these farmers could also engage in agroecological practices based on the examples presented by the settlers of PA Né Laranjeira.

The sociocultural perspective in which the relationship between researchers and the community was built required that the investigation be conducted respecting the strict formal limits of the process of recording, transcribing, and analyzing the information provided, in a way that respected the details and personal nature of the life experiences reported by the research subjects.

The rigor with the literalness of the collected explanations, a very necessary institute for this type of study, which involved relational and historical aspects, led to the adoption of the typical methodological procedures of a descriptive research (GIL, 2010, p. 28) (MARCONI and LAKATOS, 2017, p. 128) with the aim of conducting a Case Study (YIN, 2015, p.45) of the agroecological systems implemented in PA Né Laranjeira, for which the stages of the investigation process were based on the action protocols constructed according to the assumptions indicated by Yin (2015) in his work titled Case Study: Design and Methods.

Considering the methodological foundations adopted, and in light of the socioeconomic context of the community members studied, it was initially decided to promote the use of the theoretical bibliographic research method, which according to Marconi and Lakatos (2017) has the characteristic of "putting the researcher in direct contact with everything that has been written, said, or filmed about a certain subject, including conferences followed by debates that have been transcribed in some way" (MARCONI and LAKATOS, 2017, p. 200). In this way, in a second phase, it was possible to collect information directly from the subjects being researched, knowing the focal points to be addressed. For this purpose, visits were made to the settlement where semi-structured interviews were conducted with the producers residing in the communities, with the number of interviewees being chosen randomly and non-probabilistically.

Finally, through a qualitative approach, the data collected during the field research were analyzed, at which point an effort was made to characterize the state of the art of the structures of family production agroecosystems existing in the studied community.

The conception of the research stemmed from the need to produce knowledge regarding the agroecological practices developed in communities located in the Caatinga biome. The premise was that these elements, when exposed with their virtues and setbacks, would be capable of replication in other communities in the Pernambuco semi-arid region, as well as the bottlenecks, limitations, and difficulties faced by the producers of PA Né Laranjeira could be brought to light and, upon being examined, would not replicate in other similar cases.

The visits to the settlement took place between March and May 2022. During this period, participatory observation actions of the labor activities developed by the community members were promoted, and during the interaction with the farmers, semi-structured observations and interviews were conducted with the farmers participating in the Cotton in Agroecological Consortia Project (CBA, 2021), maintained and monitored by the Non-Governmental Organizations (NGOs) Diaconia and Caatinga, through Technical Assistance and Rural Extension actions. (ATER).

III. Result And Discussion

Settlement Project (PA) Né Laranjeira

The producer Maria do Socorro highlights that Né Laranjeira was created from the construction of the Entremontes dam in the area where her husband's grandfather's farm used to exist, which was called Manuel Laranjeira, and was popularly known by the nickname Né Laranjeira. As a form of tribute to him, when the settlement was implemented, the project was named Seu Né.

According to data from the National Water Agency (ANA), the Entremontes Dam was constructed between 1980 and completed in 1982 by the National Department of Works Against Droughts (DNOCS). It is a 360-meter-long dam, located at UTM coordinates, longitude 401186.09 m and latitude 9090207.40 m S, built with compacted homogeneous earth, with the slopes protected by a system of arranged granite rockfill. With a height of 29.5 m, the dam wall was built transversely to the natural course of the São Pedro Stream, which is a tributary of the Brígida River, one of the sub-basins of the sub-middle São Francisco in Pernambuco, covering a total drainage area of approximately 5,082.60 km². This contributing basin allows for the formation of a lake with the potential to flood an area of 4,688 ha upon reaching the elevation of 389.00, providing a maximum volume accumulation of 339.33 hm³ and a useful volume of 326.39 hm³ (DNOCS, 1978, p. 12). 12).

The first producers have already been living in the settlement region for over 33 years, even before the settlement process began, because before the PA many displaced farmers started to occupy what would become

the area of the current settlement. This is because, in the 1980s, there were already small settlements in the region, considering that before the land expropriation, there were communities that lived off a large local farm. However, when the Entremontes dam was being built, DNOCS carried out an expropriation process for the area to be flooded, as well as a large part of the water catchment basin for the dam to be constructed. Subsequently, compensation for the land was provided for the implementation of the reservoir, but those who did not own the land, living as sharecroppers or tenants, ended up receiving no financial compensation.

To compensate for this forced removal, DNOCS, in partnership with INCRA, began to create the necessary conditions for the implementation of a series of Settlement Projects (PA) to assist those displaced by the construction of the Entremontes dam. To make the project feasible, DNOCS donated an existing productive area on the banks of the constructed water body.

As a result of this purpose conceived by DNOCS and INCRA, the implementation of a set of settlements was planned, including: PA Entremontes (MF0133000), intended to house 107 families in an area of 1,632.4513 ha; PA Nova Vida (MF0078000) with the capacity to settle 20 family groups in 698.4575 ha; PA Valeriano Dias (MF0229000) designed to serve 68 families in an area of 919.6475 ha; PA Abel Moreira (MF0231000) intended to accommodate 30 families in an area of 513.6525 ha; PA Miguel Bernardo (MF0253000) intended to welcome 45 families in an area of 882.6874 ha; and finally, PA Né Laranjeira (MF0247000), which in an area of 664.6824 ha, would accommodate 44 families. The objective of INCRA was to settle a total of 314 family groups in the region of the municipality of Parnamirim/PE.

In the first years after the construction of the Entremontes dam, the lots for the displaced families were not divided. This process only took place in 2004, when DNOCS officially donated the rural property to INCRA, a fact that allowed the institute to start offering the subdivision and settlement of the former residents. At that time, only in the PA Né Laranjeira were 44 family groups of producers settled, for which an area on the southern bank surrounding the dam was divided and demarcated into lots to be occupied by family producers who had been fighting since the expropriation to gain possession of an area that harked back to the time and the memories and culture of their ancestors.

In 2009, the process of building the houses was initiated by the federal government, and thus in 2013 we moved to our areas, but even before the houses were ready, many of the settlers were already cultivating their areas. At that time, we lived in shacks and mud houses.

The work with agroecology dates back to 2007 when we began applying agroecological production practices in the community. At that time, technicians from the NGO Caatinga, based in the municipality of Ouricuri/PE, a city that borders Parnamirim/PE, through the Dom Helder Câmara project, started the implementation of a demonstrative project of an agroecological production system. From this model, the dissemination of agroecological production practices among the settlers began, initially with food and later the system began to incorporate animals, insects, and other products such as organic cotton, as can be seen in figures 01 and 02 presented below.

Figure 01 and 02: Farmers of PA Né Laranjeira

Source: Beserra (2022)

Highlighted the rural producer and community leader who "since the beginning in 2007, I have practiced agroecology, today I have good results, I am very grateful to have known this different system, with this sustainable and emancipatory environmental vision that the program taught us" (personal testimony D. Maria do Socorro, May 25, 2022). Maria do Socorro, May 25, 2022).

Then came social technologies such as individual cisterns and subsequently calçadão cisterns and productive backyards. It was at this moment that agroecological practices truly began, as many exchanges were carried out in cities in the region and other states, such as communities with agroecological systems in the Cariri region of Paraíba, as well as in the state of Ceará. These exchanges were promoted with the aim of seeking knowledge that could be applied and multiplied in the Pernambuco semi-arid region.

It happens that working with agroecology is not an easy task; it involves many obligations on the part of the producer, and numerous records and protocols to be followed. This ends up making it so that not all trained

farmers achieve a level of commitment that enables them to adopt agroecological practices. As a result, only a small portion of the group of settlers in the PA Né Laranjeira has truly begun to practice and live agroecology.

It is important to highlight that the protocols are nothing more than a set of rules, procedures, and good practices that must be applied in the cultural management of agroecological systems where agroecological production units are being implemented. In the specific case of cotton in consortia with other cultivars in the production system, the adoption, and especially the adherence to the protocols, is one of the pillars for obtaining and maintaining the certificate provided by participatory certification organizations.

Even considering these procedures, what is observed is that agroecological systems have the potential to be multiplied and replicated by neighbors, and basically, this is what has been happening in the community being studied. This is because, over time and with the success of the productive systems, some producers who initially had not adopted agroecological practices became interested in the new form of production and, consequently, showed interest in joining the group. Many of these producers, even those who are not yet fully engaged, already demonstrate an awareness and a vision of environmental preservation through the adoption of organic farming practices.

Currently, in the community of Né Laranjeira, there is a contingent of 6 settlers working exclusively based on the principles of agroecology, so much so that these producers are already certified and participate in groups external to the settlement. Concurrently, there are another 10 settlers who carry out their productive practices in a mixed manner, but predominantly organic, yet they are not yet able to be certified. In this group, the participants are aware that the process of promoting a transition from the conventional production system to agroecology is an intense and continuous job, and each year a new group manages to move through the initial stages and enter a more advanced stage.

In the list of INCRA beneficiaries registered as members of PA Né Laranjeira, there are 44 families; however, not all beneficiaries have established permanent residence in the settlement area. In fact, the community formed by the settlers consists of two small clusters of families or social groups. These villages are made up of small groups of producers distributed along the southern shore of the reservoir. This is due to the fact that the residences in the PA Né Laranjeira settlement were implemented in two distinct residential nuclei, one with 16 residential units and the other with 28 residences.

It is pertinent to highlight that the structures implemented by INCRA in the settlement are far below what is necessary for the settlers to live exclusively from the countryside, as the villages are located 16 km and 22 km from the highway, with access to the community being via a rural road, which has poor traffic conditions, especially during the rainy periods. Moreover, there is a lack of basic infrastructure such as a treated water system, sewage systems, schools, and health posts; even communication is poor, and cell phone signals do not reach all the homes.

With all these structural problems, despite all the settlers, to a greater or lesser extent, having some form of production in the settlement area, many, especially the elderly and the young, have chosen to live in the villages closer to the municipal seat or even along the highway.

From this perspective, in the first village, which has 16 residences, even though it is farther from the highway, only six families reside regularly in the community. The other ten family groups that make up the settlement chose not to live in the village; some have moved to the municipality seat of Parnamirim, and others to the villages of Jacaré and Veneza, communities that are located along the PE 555 highway that connects the city of Lagoa Grande/PE to Parnamirim/PE.

Similarly, in the larger village, where studies on agroecological systems were conducted, out of the 28 settlers, a group of fifteen families are regular residents of the settlement, while the others live outside the settlement. The group of producers residing in the village is predominantly composed of couples aged between 30 and 60 years, with a notable absence of school-aged youth. This is evidenced by the fact that only three children live in the community, as according to Seu João Neto, "there is no school for the children, the closest group is in Jacaré, which is far away. The municipal bus passes to take the students, but they are too small to go alone, it doesn't work out" (Personal testimony of Seu João Neto, April 16, 2022).

It is noteworthy that the certified producers are part of the group that resides in their production areas, and the group of properties in the process of changing their production system is also made up of farmers who regularly reside in the village, whereas the producers who still produce exclusively through the conventional system are precisely those farmers who no longer reside in the community.

Conventional agriculture, especially the monoculture practiced in the irrigation perimeters of the Petrolina/Juazeiro fruit-growing hub, ends up being one of the main reasons for the youth leaving the community. This is because the children of farmers who go to study at the educational institutes of the Federal Institute of Sertão Pernambucano (IF) in Ouricuri and Petrolina, or even at the Federal University of Vale do São Francisco (UNIVASF) in Petrolina/PE or at the Academic Unit of Serra Talhada (UAST), which is a campus of the Federal Rural University of Pernambuco (UFRPE) in Serra Talhada, end up being absorbed by the fruit-producing farms

in the irrigated area, which offer the regularity of formal employment and the typical structure of large cities. This competition ends up being the main concern in the family succession process of the settlers of PA Né Laranjeira.

According to the rural producer Maria do Socorro, who has three children living and working on grape farms in Petrolina/PE, "the rural exodus of young people from the countryside to the city is a reality for all communities in the hinterland, but if there were an opportunity to harness the potential that the communities in the region have to generate income for young people to live with dignity, they certainly would not leave their lands.I speak for my boys who really want to work here, but they can't raise their families here in the settlement, there are no opportunities to support their families with what is produced here, since there is no industry or even a way to process the region's products. Sometimes they produce something but there is no certain market, and with a family, a person has to live where it is better. The irrigated perimeter is a reality they like, which is agriculture, but in a different reality from the agroecological systems we adopt here. Even though they are not happy working with poison and pesticides, they have no other alternative".

The agroecological path taken by PA Né Laranjeira

Describing the path taken by the settlers of PA Né Laranjeira in search of the implementation of agroecological systems, it is not limited to the adoption of ecologically sustainable practices and cultural treatments. This journey involves the formation of a life philosophy, a sociocultural construction of a group identity, and this construction is heavily influenced by the doctrine adopted by the NGOs leading the "Agroecological Cotton Consortium Project" coordinated by Diaconia.

This can be identified in one of Diaconia's lines of action, which is to promote gender justice in its social actions and projects. It was based on this ideology that social institutions sought to include gender equality within the concept of social equity that has been disseminated in the various producer associations with whom they have worked. As a result of these doctrines, in the agroecological system of the settlement, women and men should be included in any activity being developed in the systems, considering that the identification of the positions occupied by social actors is not related to gender but to the skills of the group members. Therefore, whoever has the aptitude for carrying out a task should be in the position that requires that competence. This equality in gender representation is what allowed women like D. Socorre came to occupy leadership positions in different producer groups, this was one of the ways to achieve socio-environmental justice and reduce the inequalities and poverty established in the countryside (CAPORAL and COSTABEBER, 2004, p. 49).

As highlighted by journalist and master in Development and Environment Maristela Crispim, founder of the Association of Agroecological Farmers of Araripe - Eco Nordeste, generating income for the families of farmers in the northeastern semi-arid region through the cultivation of organic cotton in conjunction with other crops in an agroecological system was the reason that led social entities under the coordination of Diaconia to implement the "Organic Cotton in Agroecological Consortia Project", an initiative coordinated by Diaconia.

Surely one of the possible reasons for the success of the project conceived by Diaconia was the proposal to establish partnerships with recognized NGOs committed to agroecological philosophies. The experience in Agroecology enabled the organizations chosen to be responsible for the technical assistance of farmers to strengthen the work developed by the Participatory Organic Compliance Assessment Organizations (OPACs) in relation to the agroecological production developed in the production systems included in the Agroecological Cotton Consortium Project.

The OPACs are associations authorized to grant the Brazilian Organic Seal to products produced by agroecological systems. The certification of these products has allowed value to be added to the products produced by farmers' organizations and agroecological systems, in addition to fostering the rapprochement between agroecological farmers and consumers through fair trade of organic goods. This movement has enabled economic results capable of providing financial security for families, in addition to offering greater food and nutritional security for the producers.

In the specific case of the productive systems located in the region of the municipality of Parnamirim/PE, Eco Araripe is the OPAC responsible for certifying the organic compliance of the project participants. Eco Araripe has the legal authority to control the organic quality of the productions generated in the productive units, thus the products gain greater added value by bearing an organic certification. This extra income generated by organic products has made more and more farmers want to be part of the project, which has served as a model and reference for other producers.

But to bear the organic certification seal, many obstacles need to be overcome. For this, the technicians from the NGO Chapada e Caatinga have been helping the producers meet the requirements imposed by Eco Araripe for the issuance and renewal of the organic producer certificate. The NGOs developed a routine of rural technical assistance (ATER) to farmers during regular visits to the systems, an opportunity where productive practices and soil and water conservation techniques necessary to ensure the sustainability of the system are reviewed.

As seen, Eco Araripe is an NGO that promotes work through the strategy of associating with a participatory system, and this mechanism is revealed through meetings with group members and nuclei for the division and control of actions, enabling qualification and access to the market, as well as the creation of new markets, ensuring the market compliance of the product.

Describing the path taken by the settlers of PA Né Laranjeira in search of the implementation of agroecological systems, it is not limited to the adoption of ecologically sustainable practices and cultural treatments. This journey involves the formation of a life philosophy, a sociocultural construction of a group identity, and this construction is heavily influenced by the doctrine adopted by the NGOs leading the "Agroecological Cotton Consortium Project" coordinated by Diaconia.

This can be identified in one of Diaconia's lines of action, which is to promote gender justice in its social actions and projects. It was based on this ideology that social institutions sought to include gender equality within the concept of social equity that has been disseminated in the various producer associations with whom they have worked. As a result of these doctrines, in the agroecological system of the settlement, women and men should be included in any activity being developed in the systems, considering that the identification of the positions occupied by social actors is not related to gender but to the skills of the group members. Therefore, whoever has the aptitude for carrying out a task should be in the position that requires that competence. This equality in gender representation is what allowed women like D. Socorre came to occupy leadership positions in different producer groups, this was one of the ways to achieve socio-environmental justice and reduce the inequalities and poverty established in the countryside (CAPORAL and COSTABEBER, 2004, p. 49).

As highlighted by journalist and master in Development and Environment Maristela Crispim, founder of the Association of Agroecological Farmers of Araripe - Eco Nordeste, generating income for the families of farmers in the northeastern semi-arid region through the cultivation of organic cotton in conjunction with other crops in an agroecological system was the reason that led social entities under the coordination of Diaconia to implement the "Organic Cotton in Agroecological Consortia Project", an initiative coordinated by Diaconia.

Surely one of the possible reasons for the success of the project conceived by Diaconia was the proposal to establish partnerships with recognized NGOs committed to agroecological philosophies. The experience in Agroecology enabled the organizations chosen to be responsible for the technical assistance of farmers to strengthen the work developed by the Participatory Organic Compliance Assessment Organizations (OPACs) in relation to the agroecological production developed in the production systems included in the Agroecological Cotton Consortium Project.

The OPACs are associations authorized to grant the Brazilian Organic Seal to products produced by agroecological systems. The certification of these products has allowed value to be added to the products produced by farmers' organizations and agroecological systems, in addition to fostering the rapprochement between agroecological farmers and consumers through fair trade of organic goods. This movement has enabled economic results capable of providing financial security for families, in addition to offering greater food and nutritional security for the producers.

In the specific case of the productive systems located in the region of the municipality of Parnamirim/PE, Eco Araripe is the OPAC responsible for certifying the organic compliance of the project participants. Eco Araripe has the legal authority to control the organic quality of the productions generated in the productive units, thus the products gain greater added value by bearing an organic certification. This extra income generated by organic products has made more and more farmers want to be part of the project, which has served as a model and reference for other producers.

But to bear the organic certification seal, many obstacles need to be overcome. For this, the technicians from the NGO Chapada e Caatinga have been helping the producers meet the requirements imposed by Eco Araripe for the issuance and renewal of the organic producer certificate. The NGOs developed a routine of rural technical assistance (ATER) to farmers during regular visits to the systems, an opportunity where productive practices and soil and water conservation techniques necessary to ensure the sustainability of the system are reviewed.

As seen, Eco Araripe is an NGO that promotes work through the strategy of associating with a participatory system, and this mechanism is revealed through meetings with group members and nuclei for the division and control of actions, enabling qualification and access to the market, as well as the creation of new markets, ensuring the market compliance of the product.

Figure 03 and 04: Communities to which students residing in PA Né Laranjeira need to travel to attend school

Source: Beserra (2022)

It is noteworthy that the certified producers are part of the group that resides in their production areas, and the group of properties in the process of changing their production system is also made up of farmers who regularly reside in the village, whereas the producers who still produce exclusively through the conventional system are precisely those farmers who no longer reside in the community.

Conventional agriculture, especially the monoculture practiced in the irrigation perimeters of the Petrolina/Juazeiro fruit-growing hub, ends up being one of the main reasons for the youth leaving the community. This is because the children of farmers who go to study at the educational institutes of the Federal Institute of Sertão Pernambucano (IF) in Ouricuri and Petrolina, or even at the Federal University of Vale do São Francisco (UNIVASF) in Petrolina/PE or at the Academic Unit of Serra Talhada (UAST), which is a campus of the Federal Rural University of Pernambuco (UFRPE) in Serra Talhada, end up being absorbed by the fruit-producing farms in the irrigated area, which offer the regularity of formal employment and the typical structure of large cities. This competition ends up being the main concern in the family succession process of the settlers of PA Né Laranjeira.

According to the rural producer Maria do Socorro, who has three children living and working on grape farms in Petrolina/PE, "the rural exodus of young people from the countryside to the city is a reality for all communities in the hinterland, but if there were an opportunity to harness the potential that the communities in the region have to generate income for young people to live with dignity, they certainly would not leave their lands". I speak for my boys who really want to work here, but they can't raise their families here in the settlement, there are no opportunities to support their families with what is produced here, since there is no industry or even a way to process the region's products. Sometimes they produce something but there is no certain market, and with a family, a person has to live where it is better. The irrigated perimeter is a reality they like, which is agriculture, but in a different reality from the agroecological systems we adopt here. Even though they are not happy working with poison and pesticides, they have no other alternative.

The Agroecological Path Traveled by PA Nê Laranjeira.

Describing the path taken by the settlers of the PA Né Laranjeira in their pursuit of implementing agroecological systems, it is not limited to the adoption of ecologically sustainable practices and cultural treatments. This trajectory involves the formation of a life philosophy, a sociocultural construction of a group identity, and this construction is heavily influenced by the doctrine adopted by the NGOs leading the "Agroecological Cotton Consortium Project" coordinated by Diaconia.

This can be identified in one of Diaconia's lines of action, which is to promote gender justice in its social actions and projects. It was based on this ideology that social institutions sought to include gender equality within the concept of social equity that has been disseminated in the various producer associations with whom they have worked. As a result of these doctrines, in the agroecological system of the settlement, women and men should be included in any activity being developed in the systems, considering that the identification of the positions occupied by social actors is not related to gender but to the skills of the group members. Therefore, whoever has the aptitude to carry out a task should be in the position that requires that competence.

This equality in gender representation is what allowed women like D. Socorre came to occupy leadership positions in different producer groups, this was one of the ways to achieve socio-environmental justice and reduce the inequalities and poverty established in the countryside (CAPORAL and COSTABEBER, 2004, p. 49).

As highlighted by journalist and master in Development and Environment Maristela Crispim, founder of the Association of Agroecological Farmers of Araripe - Eco Nordeste, generating income for the families of farmers in the northeastern semi-arid region through the cultivation of organic cotton in consortium with other crops in an agroecological system was the reason that led social entities under the coordination of Diaconia to implement the "Agroecological Cotton Consortium Project", an initiative coordinated by Diaconia.

Surely one of the possible reasons for the success of the project conceived by Diaconia was the proposal to establish partnerships with recognized NGOs committed to agroecological philosophies. The experience in Agroecology enabled the organizations chosen to be responsible for the technical assistance of the agroproducers to strengthen the work developed by the Participatory Organic Compliance Assessment Organizations (OPACs)

in relation to the agroecological production developed in the production systems included in the Agroecological Cotton Consortium Project.

The OPACs are associations authorized to grant the Brazilian Organic Seal to products produced by agroecological systems. The certification of these products has allowed value to be added to the products produced by farmers' organizations and agroecological systems, in addition to fostering the rapprochement between agroecological farmers and consumers through a fair trade of organic goods. This movement has enabled economic results capable of providing financial security for families, in addition to offering greater food and nutritional security for the producers.

In the specific case of the production systems located in the region of the municipality of Parnamirim/PE, Eco Araripe is the OPAC responsible for certifying the organic compliance of the project's participants. Eco Araripe has the legal competence to control the organic quality of the productions generated in the production units. As a result, the products gain greater added value by carrying an organic certification. This extra income generated by organic products has made more and more farmers want to be part of the project, which has served as a model and reference for other producers.

But to display the organic certification seal, many obstacles need to be overcome. For this, the technicians from the NGO Chapada e Caatinga have been helping the producers meet the requirements imposed by Eco Araripe for the issuance and renewal of the organic producer certificate. The NGOs developed a routine of rural technical assistance (ATER) for farmers during regular visits to the systems, an opportunity where productive practices and soil and water conservation techniques necessary to ensure the sustainability of the system are reviewed.

As seen, Eco Araripe is an NGO that promotes work through the strategy of associating participatory systems, and this mechanism is revealed through meetings with group members and nuclei for the division and control of actions, enabling qualification and access to the market, as well as the creation of new markets, ensuring the market's compliance with the products being marketed.

In this way, it is the participatory guarantee system where groups conduct verification visits to promote social control of the services performed by the farmers associated with their production system. This self-evaluation is based on the principle of collective responsibility among the program participants, considering that the failure of one reflects on the entire group.

In the Né Laranjeiro settlement, it was through the project that the settlers began to plant cotton intercropped with food and forage crops, as well as gaining access to strategies for coexisting with the semi-arid climate, that is, procedures, protocols as they call them, which guided them to avoid plant overcrowding, considering the importance of reducing water loss through evapotranspiration. Another technique that the producers were also encouraged to adopt refers to intercropping, considering that this process exposes the crops to a lower risk of crop loss compared to monocultures.

Figure 05 and 06: Agroecological system for the production of PA Né Laranjeira.

Source: Beserra (2022)

As highlighted by Moreira et al. (2021), the Agroecological Cotton Consortium Project is a global initiative that is being coordinated in Brazil by Diaconia, which receives financial support from the Laudes Foundation, the International Fund for Agricultural Development (IFAD), and the Inter-American Foundation. (IAF). In the specific case of the PA Né Laranjeira, Diaconia has been working in partnership with other organizations such as Chapada, Caatinga, and Eco Araripe, in the process of providing assistance in the implementation of an agroecological seed production system.

In addition to this program, the Né Laranjeira settlement was benefited by the Brazilian Semi-Arid Articulation (ASA) with a project for access to rainwater harvesting and storage technologies for food production. The cisterns from the First Water program, as well as the sidewalk and runoff cisterns, the underground dams, and the trench dams, were some of the actions implemented by the Rural Community Education Center (Cecor)

and Caatinga in the community with the aim of mitigating the effects of drought and enabling sustainable rural development.

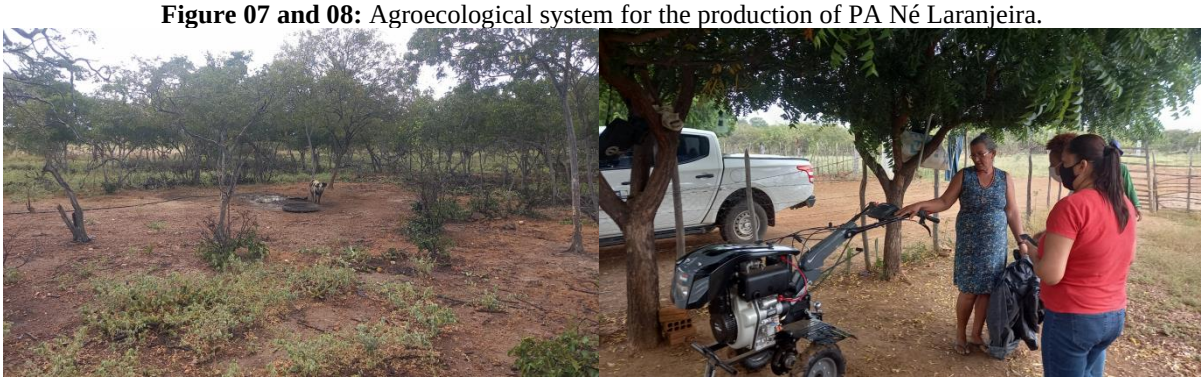
In turn, in the year 2018, INCRA drilled and installed three tubular wells in the PA area, one of which serves the lot of farmer Socorre Neto, one of the leaders of the settlement. However, according to the settler, the water from the wells is brackish and is not used for regular irrigation of plants, considering that besides the cost of energy, the settlers understand that the uncontrolled use of irrigation systems in regions with soil characteristics found in the semi-arid Pernambuco tends to be a significant problem in anthropogenic action, potentially leading to the loss of the soil's productive capacity over time, due to soil sodification or even salinization.

To work the soil of the plots, the settlers opted to use microtractors, because unlike conventional agricultural tractors, which not only compact the ground but also cause excessive movement of the productive layers of the soil, removing nutrients and pushing aerobic microorganisms to the lower layers, leading to soil depletion and causing significant environmental impacts due to soil mechanization. As one of the producers highlights, according to whom "the soil is the farmer's greatest friend because fertile soil is capable of generating life.

The use of agricultural microtractors is not about ending mechanization but rather about reducing the negative impacts that mechanization causes to the soil, balancing the benefits of reducing the workload for farmers without causing stress to the cultivable layers of the soil, thereby compromising its fertility. To this end, the controlled use of mechanical equipment promotes the reduction of effects on the quality, health, and especially the structure of the soil.

But even for the use of microtractors, there is a protocol that needs to be followed by producers when operating in their agroecological systems. The idea is to promote movement in the layer of organic matter formed by the accumulation of straw and crop residues, enabling the formation of organic fertilizer from the deposited material. As a result of this procedure, the use of bi-fertilizer has even been reduced in the community, considering the amount of organic matter that is reused in the soil fertilization process.

Figure 07 and 08: Agroecological system for the production of PA Né Laranjeira.



Source: Beserra (2022)

Still according to the Agrarian Reform settler, as a practitioner of agroecological agriculture, one cannot neglect the planting and soil management protocols, as it is from the soil that the wealth of the property comes. Dona Socorro highlights that it was agroecology that allowed her family to rise out of poverty, but this requires commitment and time. "They say three years is the transition period, but I believe three years is a time for adaptation. After this time, the farmer begins to produce on their own and starts to improve their income, the family becomes stabilized, but this process does not end", highlighted the guardian of heirloom seeds produced in the community.

The Protocol that the farmers often talk about is actually an action methodology implemented by the Cotton in Agroecological Consortia Project (CBA, 2021). This instrument outlines principles to be followed, such as cotton plant density, planting in alternating strips with other crops, and management methods when diseases and invasive plants appear, like the cotton boll weevil (Anthonomus grandis), which has not disappeared but is only controlled with traps and planting techniques.

Besides the cotton boll weevil, the cotton crop in the semi-arid region suffers greatly from the presence of the pink bollworm (Pectinophora gossypiella), which is a species of moth with a high potential to cause economic damage to the cotton crop. The pink bollworm is a microlepidopteran that lays its eggs on the cotton bolls; as the larvae develop, they end up causing a decrease in the productivity and quality of the cotton. It is important to highlight that the presence of moths is more frequently recorded at the end of the harvest, an opportunity when they should be captured to prevent the emergence of caterpillars.

The truth is that according to the producers, the protocol standards help increase the number of flower buds per plant. Thus, the number of flower buds per planted area unit also increases. This technique, according to Diaconia (2020), enables a significant increase in the number of apples per plant, boosting the final profit,

considering that "the densification of plants contributes to the decrease in cotton productivity in agroecological consortia". (DIACONIA, 2020).

Production that, in the understanding of the president of the Laranjeira Settlement Project Association, has contributed to improving the lives of the settlers, who identify the technical assistance provided by NGOs as a way to improve management and cultural practices. In addition to raising awareness about the need to maintain good farming practices, as well as meeting the necessary requirements for obtaining participatory organic certification for cotton in agroecological consortia of productive family units, and preserving the status of Participatory Organic Conformity Assessment Organizations (OPACs) that the settlement possesses.

The importance of being inserted in a broader context is the certainty of applying procedures grounded in a consolidated environmental awareness and with concrete results. Information provided by Diaconia (2022) indicates that in the execution of the project in the territories, including the area of PA Né Laranjeira, it has been carried out in the form of partnerships with local NGOs experienced in Agroecology, which are responsible for providing technical assistance to the OPACS regarding agroecological production. In the Sertão Central, the NGOs Caatinga and Chapada are the implementing arms of Diaconia.

As a result of the organic cotton planting project for the production of cotton fiber with participatory organic certification, which is what has been produced by the farmers settled in Parnamirim/PE, the Agroecological Cotton Consortium Project has planned, including a purchase commitment, the supply of 50 tons of certified organic cotton fiber and an additional 13 tons of products in the process of agroecological transition for certification, with the expected gain for 2022 being around 25% compared to non-certified cotton.

In the case of PA Né Laranjeiro, similar to what was presented in the works of Tittonell (2019), there are three groups of producers. The first group is made up of those who are already part of the agroecological transition process. After the intervention of social organizations, they consciously and deliberately chose to adopt the philosophical principles of agroecology, and as a consequence of this choice, they embraced recognized and certified agroecological practices. There is also a group of producers who, in their production process, already employ agroecological management, even without knowing it, but they still haven't been able to completely rid themselves of conventional practices of fertilization, fertilization, and especially the use of herbicides and pesticides. Finally, there are the farmers who, despite having been introduced to agroecological practices, chose to continue with the traditional management of their plots, where they practice extensive breeding of goats and sheep, in addition to producing beans and corn during the rainy periods.

Even if implicitly, it is possible to identify in the agroecological systems of cotton production in agroecological enclaves implemented in the PA Né Laranjeira by Diaconia in consortium with FIDA, in partnership with the NGOs Caatinga, Chapada, and Eco Araripe, a dialogue between the culture of the producers and the semi-arid region with its climatic particularities.

This partnership has led to a reduction in the work carried out by the farmers in the region as it has increased the efficiency of the systems. The agricultural practices passed on by NGO technicians through monitoring and qualified technical assistance have managed to minimize the chances of production loss due to issues related to pest and weed infestations, or even due to planting at the wrong time or in the wrong way.

In the case of the association, the intercropped cotton project also clearly demonstrates the phases of agroecological transition presented by Gliessman. (2010). The four phases of the transition began when the community started to make an environmentally harmonious use of the water from the well installed by INCRA in the community, to promote survival irrigation for the area of 1 hectare of cotton in agroecological consortium, this was the starting point for the development of the project in the settlement.

Not forgetting that even before the cotton, "cover crops", as the settlers call them, were introduced in this space; these plants were responsible for the soil recovery of this area to be cultivated in the plots. Only after the soil was recovered was the planting of crops in consortium with cotton carried out.

According to Dr. Fábio Santiago, an agricultural engineering expert and project coordinator, the methodology adopted in the project was to conduct experiments to generate knowledge within the community itself. This is because "knowledge is generated from practice and the formation of consortium management, as well as from exchanges, which are a primary tool for the exchange of knowledge between producers and local managers" (Personal statement by Dr. Fábio dos Santos Santiago, 2021), so that the model can be disseminated to new families in the semi-arid region. Fábio dos Santos Santiago, 2021), so that the model can be disseminated among new families in the semi-arid region.

As observed in the chronology of the previously narrated events, in PA Né Laranjeira, to a greater or lesser extent, what is reported by researcher Casado (2013) occurred, that is, the four phases of the agroecological transition process described by Gliessman (2010), which took place linearly, starting with the abandonment of agrochemicals, followed by the use of organic fertilizers, such as organic slurries that began to be used in soil preparation amid a process of "agroecological transition of the agroecosystem" (GLIESSMAN, 2010).

But the journey of the settlers did not stop there, considering that the community was still the setting for the conversion of agroecosystems, as the settlers chose to renounce typical practices "of the conventional style of

agriculture" (CAPORAL et al., 2010, p. 95) in favor of socioeconomically and environmentally sustainable agroecological habits. Finally, the reality of the settlers allows us to ascertain that the Né Laranjeira community has reached the final level indicated by Gliessman (2010) in that, through barter and the commercialization of products produced in the community, they managed to spread their products both within the territory and beyond. With this, from the perspective that they have achieved their food sovereignty, the commercialization of organic cotton enables an economic emancipation of the producers, creating what Gliessman (2010) would call the "culture of sustainability and interactions among all components of the agro-food system" (2010).

It is important to highlight the resilience of the agro-producers of PA Nê Laranjeiro; this characteristic aligns closely with the concept of resilience advocated by Tittonell (2019), who emphasizes that despite the various ways of representing the agroecological transition process, a peculiarity is usually present in cases where producers have managed to persist in their environmental sustainability goals. This idiosyncrasy is what the researcher describes as the resilience of the socio-ecosystem, which ultimately would be the "capacity of a system to emerge from an undesirable situation or remain in a desirable situation" (TITTONELL, 2019, p. 240).

Wouldn't this ability to self-organize their productive activities in ways that conform, or rather, harmonize, the production and cultivation practices with the environmental, climatic, and cultural particularities of the semi-arid Pernambuco region, be what was developed in PA Né Laranjeiro by the organic cotton producers. Or was it not this resilience that allowed the community's agroecological systems, unlike most other cotton producers in the region, to safeguard their culture, their production areas, and even their essential attributes, regardless of the presence of water issues and the cotton boll weevil (Anthonomus grandis), which remains a disturbance in Tittonell's terms (2019).

IV. Final Considerations

In the transition process identified in PA Né Laranjeiro, the role played by social organizations that supported the communities deserves special mention. They provided the knowledge, assistance, and necessary follow-up for the farmers to undertake the journey towards the transition. It was the social organizations that guided the community in redesigning the agroecosystem and later introduced the practices of production, management, and governance that allowed the farmers to overcome the obstacles that are always encountered along the way. Thus, unlike most farmers who find it difficult at the system redesign stage, in the case of the settlement, this process was less painful and the adoption was built gradually and participatively.

Much is said about a transition that produces effects in the territory, the region, and the country, but this ideal of a socioeconomic and environmental project has as its starting point the agroecological community of the group of farmers who are appalled by the social and environmental damage caused by conventional agriculture (CAPORAL et al., 2010, p. 95) and choose to oppose this reality.

The training and capacity-building work that Diaconia and its partners have been carrying out in the community goes far beyond the teachings on planting processes and soil conservation techniques. Much of this choice stems from the philosophy adopted by the institution, which identifies in the agroecological ideology an opportunity to understand how the "group identity" (BOURDIEU, 1996, p. 108) and its social reality are being socially structured. To this end, the relationship between NGOs and social actors is based on a break with the reality of conventional agriculture in search of an agroecological transition that involves socio-environmental and economic transformations within the group.

Therefore, the work at PA Né Laranjeiro was developed focusing on the social and cultural issues of the group, aiming to produce a reconstruction of the group's identities, enabling the creation of a social, collective, and environmental identity consciousness. It did not seek to form producers, but rather a collective and sovereign agroecological system, where farmers do not use pesticides or industrial fertilizers as a principle of life, and not because they are "poor, unprotected, whose practitioners do not have or have not had access to modern inputs". (CAPORAL e COSTABEBER, 2004, p. 49).

It can be highlighted that the habits, skills, and productive procedures, collectively built through the action of Diaconia and its partners, through the cotton in agroecological consortia program, have been achieving the goal of forming a philosophy of life and production based on an agroecological consciousness, not only in environmentally correct practice, but also as a consequence of the economic poverty in which the families of the Né Laranjeira settlement are placed, due to the absence of the state through public policies.

However, it is important to heed D. Socorro's message when she states that the agroecological transition is a "process that does not end" and, consequently, that complacency or regression lurks, waiting for accommodation or a lack of reverence to agro-environmental protocols, and certainly at the first lapse of the producer, a long journey will have to be undertaken once again.

Reference

[1] Agência Estadual De Planejamento E Pesquisas De Pernambuco - Condepe/Fidem. Pernambuco Em Mapas. Recife, 2011. 159p.
[2] Albuquerque, Diêgo Souza Et Al. Cenário Da Desertificação No Território Brasileiro E Ações De Combate À Problemática No Estado Do Ceará, Nordeste Do Brasil. Desenvolvimento E Meio Ambiente, V. 55, 2020.

[3] Barbosa, Eduardo Martins. Crítica Ao Modelo Atual De Desenvolvimento Agrícola À Transição Agroecológica No Semiárico. Encontro Nacional De Agroecologia (Rio De Janeiro/Rj) Encontro Nacional De Agroecologia: Anais. Osvaldo Santana Alves [Ilust.] - Rio De Janeiro: Aspta, 2002. 25-32.
[4] Bourdieu, Pierre Félix. A Economia Das Trocas Lingüísticas. São Paulo: Edusp, 1996.
[5] Caporal, Francisco Roberto; Costabeber, José Antônio. Agroecologia: Aproximando Conceitos Com A Noção De Sustentabilidade. In: Ruscheinsky, A. (Org) Sustentabilidade: Uma Paixão Em Movimento. Porto Alegre: Sulina, 2004. P. 46-61.
[6] Caporal, Francisco Roberto; Costabeber, José Antônio; Paulus, Gervásio. Agroecologia. Teoria E Pratica Degli Agroecosistemi. Città Studi Edizioni, De Agostini Scuola Spa, Novara, 2010.
[7] Casado, Gloria Isabel Guzmán. Transición Agroecológica: Donde Confluyen La Investigación Y La Acción. Laboratorio De Laboratorio De Historia De Los Agroecosistemas, Sevilla: Universidad Pablo De Olavide, P. 1-12, 2013.
[8] Diaconia. Projeto Algodão Em Consórcios Agroecológicos. 1º Relatório De Monitoramento Ano 1. Recife, Pe: Diaconia, 2019.
[9] Diaconia. Projeto Algodão Em Consórcios Agroecológicos. 4º Relatório De Monitoramento Ano 2. Recife: Diaconia, 2020.
[10] Dnocs. 3. D. R. Memória Descritiva E Justificativa Do Projeto Do Açude Público Entremontes. Recife: Dnocs, 1978. 16 P.
[11] Gil, Antônio Carlos. Como Elaborar Projetos De Pesquisa. 5. Ed. São Paulo: Atlas, 2010.
[12] Yin, Robert K. Estudo De Caso: Planejamento E Métodos. Bookman Editora, 2015.
[13] Macrae, R. J.; Hill, S. B.; Mehuys G. R.; Henning, J. Farm-Scale Agronomic And Economic Conversion From Conventional To Sustainable Agriculture. Advances In Agronomy, V. 41, P. 155–198, 1990.
[14] Marconi, Mariana De Andrade; Lakatos, Eva Maria. Fundamentos De Metodologia Científica. São Paulo: Atlas, 2017.
[15] Moreira, C. S. Et Al. Avaliação De Sistema De Irrigação Por Gotejamento Para A Produção De Sementes Agroecológicas No Sertão Do Araripe–Pe. Florianópolis: Cba, 2021.
[16] Santiago, Fábio Dos Santos Et Al. Variabilidade Pluviométrica Em Agricultura De Sequeiro No Sertão Do Pajeú - Pernambuco. In: Simpósio Brasileiro De Recursos Hídricos, 20., 2013, Bento Gonçalves. Anais... Bento Gonçalves: Abrh, 2013. V. 1, P. 1- 7.
[17] Tittonell, Pablo. Las Transiciones Agroecológicas: Múltiples Escalas, Niveles Y Desafíos. Revista De La Facultad De Ciencias Agrarias Uncuyo, V. 51, N. 1, P. 231-246, 2019. Disponível Em: Http://Revistas.Uncu.Edu.Ar/Ojs3/Index.Php/Rfca/Article/View/2448. Acesso Em: 2 Jun. 2022.