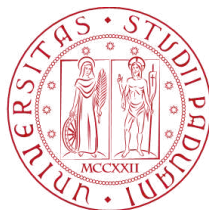


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The GATI Project: boosting agroecological practices
in the Cachoeirinha Indigenous Land - Brazil

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Declaration of Originality

The candidate declares that the present work is original and has not already been submitted, totally or in part, to attain an academic degree in other Italian or foreign universities.

The candidate also declares that all the materials used during the preparation of the thesis have been explicitly indicated in the text and in the section "Bibliographical references" and that any textual citations can be identified through an explicit reference to the original publication.

Abstract

This thesis aims to examine the impact of the GATI Project on agroecology development within the Cachoeirinha Indigenous Land. Emphasis is placed on recognizing agroecology's significance as a sustainable development approach that contributes to the preservation of the traditional knowledge of the Terena people. The project aimed to address environmental and territorial management issues while respecting the cultural heritage and autonomy of the indigenous population. By the analysis of documents, academic literature and interviews the study concludes that the GATI project was successful in boosting agroecology in this community due to the follow aspects: i) the way it was formulated; ii) there was significant involvement and engagement of participants in all the developed activities; iii) the Terena people already had a culture in agriculture; iv) there was a recognition that agroecology could include the spiritual aspect of Terena culture, the ethnoagroecology; v) the creation of the CAIANAS organization.

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Acronyms

APOINME - Articulação dos Povos Indígenas do Nordeste, a Minas Gerais e Espírito Santo

ARPIPAN - Articulação dos Povos Indígenas do Pantanal

ARPINSUL - Articulação dos Povos Indígenas da região Sul

BMAA - Brazilian Meeting on Alternative Agriculture

CAIANAS - Coletivo Ambientalista Indígena de Ação para Natureza, Agroecologia e Sustentabilidade

CBD - Convention on Biological Diversity

CI - Conservation International

CNPI - Conselho Nacional de Política Indigenista

COIAB - Coordenação das Organizações Indígenas da Amazônia Brasileira

COP - Conference of the Parties

CU - Conservation Unit

DPS - Demonstrative Projects Subprogram

DRC - Deliberative Regional Council

EN - Experience Network

FUNAI - Fundação Nacional de Povo Indígenas

GATI - Gestão Ambiental e Territorial Indígena

GDP - Gross Domestic Product

GEF - Global Environment Facility

GIZ - Deutsche Gesellschaft für Internationale Zusammenarbeit

IPS - Indian Protection Service

NGO - Non-governmental organization

PA - Protected Areas

PGIS - Participatory Geographic Information Science

Planapo - Plano Nacional de Agroecologia e Produção Orgânica

PNGATI - Política Nacional de Gestão Territorial e Ambiental de Terras Indígenas

PNAP - Plano Estratégico Nacional de Áreas Protegidas

Planapo - Política Nacional de Agroecologia e Produção Orgânica

PMU - Project Management Unit

PPTAL - Projeto Integrado de Proteção às Populações e Terras Indígenas da Amazônia Legal

PROBIO - Projeto de Conservação e Utilização Sustentável da Diversidade Biológica Brasileira

PPG7 - Pilot Program for the Protection of Brazil's Tropical Forests

RC - Regional Coordination

RA - Reference Area

SPP - Small Projects Program

TNC - The Nature Conservancy

UN - United Nations

UNCED - United Nations Conference on Environment and Development

CBD - Convention on Biological Diversity

UNDP - United Nations Development Programme

UNEP - United Nations Environment Programme

UNFCCC - United Nations Framework Convention on Climate Change

WWF - World Wildlife Fund

Introduction

The emergence of agriculture, over ten thousand years ago, caused significant transformations in humanity's relationship with nature. One of these changes was the sedentarization of nomadic groups and an exponential increase in population, since food could be provided for a growing number of people. The development of productive technologies for agriculture accompanied population growth and rising life expectancy. The technological changes in agriculture facilitated a slow and gradual process of control over elements of nature by humans. This process was intensified in its transformative power with the transition to the capitalist mode of production (Souza, Medrado, 2015).

While earlier agricultural methods relied on traditional knowledge established during the consolidation of agriculture, the technologies advanced by capitalism created a deeper rupture between society and nature. These agricultural advancements became an added element in the social class division by turning 'agriculture' into the bourgeoisie's exclusive domain and eradicating indigenous populations' traditional practices and wisdom. The intensification of the rift between society and nature, as well as between the rich and the poor, occurs with the Green Revolution (Souza, Medrado, 2015).

The Green Revolution began in the late 1960s and early 1970s when the agricultural model became characterized by the combination of chemical inputs (fertilizers and pesticides), mechanical inputs (tractors, mechanical harvesters), and biological inputs (improved varieties). These developments led to the creation of high-yielding crop varieties, reliant on a comprehensive set of practices bundled as the "technological package" of the Green Revolution (including chemical inputs, pesticides, irrigation, and agricultural machinery). A structure of subsidized rural credit was created, and simultaneously, an educational, research, and rural extension structure associated with this agricultural model was established. With the support of governmental bodies and international organizations, the Green Revolution rapidly expanded worldwide, promoting intense standardization of agricultural practices and artificialization of the natural environment (Santilli, 2009).

Since then, a primary justification behind the proliferation of this agricultural model, notably by the United States and Europe, into developing countries rested on the assurance that it would eradicate hunger. However, this expectation did not materialize, mainly due to the unequal global impact of agricultural modernization and the Green Revolution. Only specific social and economic segments benefited from technological advancements and increased yields and productivity resulting from the replacement of traditional agricultural systems with modern ones. This new model mainly favored monoculture rural properties focused on exporting cash crops. Therefore, the majority of farmers in Latin America, Asia, and Africa did not benefit from the Green Revolution. The technological packages required in this agricultural model were too expensive and inaccessible for small-scale farmers (Santilli, 2009).

The socio-environmental impacts of the agricultural production model generated by the Green Revolution have become increasingly evident: contamination of food, human and animal poisoning, the emergence of pests resistant to pesticides, contamination of water and soil, soil erosion and salinization, desertification, deforestation, economic marginalization of small farmers, loss of food sovereignty, rural exodus and migration to cities, unemployment, etc. (Santilli, 2009).

The evolution of this model not only transformed agriculture but also triggered a significant concentration of power among certain corporations, resulting in monopolies over technology and natural resources. As Agribusiness solidified its role as the predominant productive, economic, and political model in the Brazilian rural landscape, socio-environmental consequences have grown significantly. This dominance caused the loss of diverse techniques and wisdom accumulated by different communities over thousands of years. It standardized and privatized the cultivation and propagation of species, posing a threat to both food security and sovereignty. Food and natural resources were then viewed primarily as commodities for the market rather than as essential for fulfilling basic human needs. The introduction and acceptance of genetically modified seeds, along with the heightened reliance on pesticides, have

marginalized indigenous communities and disregarded ancient agricultural and natural wisdom (Souza, Medrado, 2015).

In Brazil, agricultural modernization was deeply linked to the idea of progress. The implementation of the Green Revolution, through an extensive credit program and other government incentives, solidified the conception of progress in rural areas as production based on the intensive combination of technology, capital, and information (Castro, 2015). Delgado (2012) frames this process as a Conservative Modernization. It technically modernized agricultural practices but endorsed (and exacerbated) land concentration and exclusion in rural areas. Indigenous territories were expropriated, denying land to peasants and traditional populations.

The agricultural-ecological crisis prevalent across much of the Third World was a consequence of the shortcomings of the prevailing development paradigm. Conventional development strategies have proven fundamentally limited in promoting equitable and sustainable development. They have been unable to reach the poorest or solve the problems of hunger, malnutrition, or environmental issues. Technological innovations have not become available to small or resource-poor farmers on favorable terms, nor have they suited their agroecological and socioeconomic conditions (Chambers and Ghildyal, 1985). Around the world, there has been a rise in critical opinions and opposition toward industrial agriculture. After centuries of colonial agricultural expansion and exportation, the advent of the Green Revolution enforced an increased intensification of agricultural land, particularly in the Global South (Svärd, 2021).

Therefore, the discussion on sustainable development has gained rapid attention in response to the decline in rural life quality and the degradation of the natural resource base associated with modern agriculture. The concept of sustainability remains useful as it acknowledges that agriculture is affected by the evolution of socio-economic and natural systems. Essentially, agricultural development is shaped by a multitude of factors interacting in a complex manner. It is not a simple technical matter; instead, it is

seen as a process shaped by social, cultural, political, and economic influences (Conway and Barbier, 1990).

The approaches that view sustainability issues solely as a technological challenge in production fail to address the fundamental reasons behind the unsustainability of agricultural systems. New sustainable agroecosystems cannot be established without a change in the socioeconomic determinants governing what is produced, how it is produced, and for whom it is produced. In other words, development strategies must encompass not only technological aspects but also social and economic concerns. Policies and actions based on such a strategy can confront the structural and socioeconomic factors that drive the agricultural-environmental crisis and the enduring rural poverty in the developing world (Altieri, 1989)

Therefore, in opposition to the agribusiness model, grassroots resistance in rural areas has constructed a perspective on production and life based on the principles of agroecology. Agroecology proposes the reconstruction of social and productive relationships in rural areas based on a logic of more harmonious coexistence with nature and greater equality among social classes (Souza, Medrado, 2015).

For advocates of agroecology, increasing productivity and profitability cannot be the main goal of agricultural production. Firstly, it is necessary to ensure the dignified survival of people engaged in these activities (such as agriculture, extractivism, collection, artisanal fishing, etc.), as well as the survival of the planet, through the use of sustainable resource management techniques and biodiversity conservation. This presupposes a model based on small, decentralized production units, supported by a fruitful dialogue between traditional and scientific knowledge, in a fair integration of humans into the natural environments they inhabit. This is not merely a proposal for agriculture; it includes the construction of a sustainable society, in which many other issues - such as the role of the market, responsible consumption, and knowledge production - should also be redefined (Silinprandi, 2009).

Among the fundamental elements of agroecology, as highlighted by Altieri (1989) and Gliessman (2000), is the valorization of traditional cultures and the recovery of knowledge about agriculture practiced in indigenous systems. Indigenous traditional techniques and the wisdom historically constructed by these peoples about agriculture have been positioned as integral parts of the consolidation of the agroecological proposal. According to Chambers (1983), agroecology provides the methodological tools necessary for community involvement to become the driving force behind the goals and activities of development projects. The goal is to empower farmers as the architects and primary drivers of their own development.

The indigenous communities in Brazil maintain a deep connection with the land and nature, evident in their agricultural methods. These practices encompass social, cultural, and spiritual aspects that extend beyond mere technical or economic elements (Benvenuto, Correa, and Andrade, 2023). As per Norder *et al.* (2019), the agricultural practices of indigenous peoples constitute an integral part of their way of life, deeply rooted in their traditions and spirituality. These communities regard the land not as an object to exploit but as a living entity deserving of reverence and careful management. Indigenous agricultural practices emphasize agrobiodiversity, showcasing various cultivated plants and raised animal species. This diversity stems from their enduring interaction with nature and the process of natural selection over time. The cultivation and management techniques employed by indigenous groups are tailored to local conditions, considering natural cycles, climate variations, and the specific characteristics of the soil and environment (Norder *et al.*, 2019).

Western Scientists have begun to acknowledge the significance of indigenous land-use practices and their role in addressing climate change, both in adaptation and mitigation efforts, while also providing essential resources like water, food, and energy to urban areas (De Walt, 1994). Within the field of agroecology, several experts defend that indigenous knowledge systems hold the potential to support rapid adaptation to complex and urgent crises and inspire the new models of agriculture that humanity needs in this period marked by ecosystem degradation and climate change. The merits of traditional

agroecosystems, rooted in ecological models fostering sustainability and resilience, stand as a valuable resource for agroecologists seeking to comprehend the workings of diversified agroecosystems (Altieri, 2002).

However, the advancement of agricultural and economic frontiers, especially in the Amazon, has brought a series of socio-environmental pressures on Indigenous Lands¹ surpassing institutional capacities to protect these lands. Data on deforestation rates around Indigenous Lands enclose a range of pressures, including timber exploitation and invasion by farms, settlers, miners, and others. Recently, there has been a reduction in the original size of indigenous territories, as demarcated lands generally represent fractions of the areas once available to indigenous peoples before the arrival of national expansion fronts, resulting in habitat fragmentation in the surrounding areas due to deforestation and changes in land use models (FUNAI, 2013).

These changes in land use in the surrounding areas end up being associated with internal pressure on the natural resources of Indigenous Lands, as indigenous communities, now with greater access to healthcare, experience demographic recovery, replenishing the population lost to epidemics and other causes during contact with the national society. In addition to environmental pressures external to Indigenous Lands, the increase in the indigenous population in the country has led to the intensification of natural resource exploitation, which, together with the new economic needs of indigenous peoples for consumer goods, has led to the replacement of traditional forms of resource management and use (FUNAI, 2013).

Territories that were once broader and had more fluid boundaries now have fixed limits, marked by State-demarcated lands, subject to pressures caused by commercial exploitation of certain resources, whether conducted by indigenous peoples themselves or by third parties. A range of natural resources is involved in this scenario: from traditional exploitation practiced within certain sustainability frameworks, such as

¹ According to anthropological studies a difference between Indigenous Lands and Territories can be established. Gallois (2004) states that the concept of "Indigenous Land" relates to the political-legal process conducted under the State jurisdiction, while that of "territory" refers to the culturally variable construction and experience of the relationship between a specific society and its territorial base.

Brazil nuts, rubber, açaí, among other products, to exploitation deemed predatory resulting in greater environmental damage and resource compromise, such as logging, mining, and commercial fishing (FUNAI, 2013).

In 2004, the indigenous movement and the Brazilian government started a debate about the need to build a broader territorial management policy encompassing all of the Brazilian lands. However, as highlighted by Miranda (2006) research centers as well as ethnodevelopment programs in indigenous communities have often failed because they do not take into account that each people has their own system of perceiving and interpreting ethno-cultural relationships. Brand (2003) points out that one of the causes of the failures observed in the so-called "development projects" implemented in traditional societies, especially in indigenous communities, is the disregard or lack of knowledge about the unique characteristics of indigenous economies and their relationships with the environment in which they live.

In this regard, the GATI (Indigenous Environmental and Territorial Management)² project was created with the proposal of emphasizing indigenous participation during the development of its activities, especially regarding the topic of agroecology, agroforests and environmental restoration. This participatory approach brings with it respect and appreciation for indigenous knowledge and the exchange of knowledge, and instead of bringing ready-made models as solutions, it encourages the joint search for actions (Miller *et al.*, 2016).

In what concerns the aforementioned topics, this approach emphasizes the importance of "horizontal capacity building," from farmer to farmer, with the interchange of information among peers. Specifically, regarding the approach to agroecology, it is important to stress that it encompasses a set of concepts that are not only technical but also political-ideological. In order to avoid merely importing this set of external concepts and practices, the GATI Project sought their reinterpretation and adaptation, so

² In Portuguese: *Gestão Ambiental e Territorial Indígena*.

that the initiatives developed would truly constitute an "indigenous agroecology" (Miller *et al.*, 2016).

The approach of incorporating indigenous knowledge and practices into the development of activities was implemented in the Cachoeirinha Indigenous Land, home to the Terena People, who have a natural inclination towards farming. However, in the past, the Brazilian government influenced many Terena farmers to adopt mechanized agriculture, which relied heavily on monoculture, pesticides, and chemical fertilizers. As a result, the number of individuals utilizing traditional agricultural knowledge has considerably diminished. In this context, the concept of an ecological-based agriculture led by indigenous individuals, captured the interest of the Terena community and they became actively involved in the initiatives undertaken by the GATI Project (Miller *et al.*, 2016).

Therefore, the objective of this thesis is **to examine the impact of the GATI Project on agroecology development within the Cachoeirinha Indigenous Land. Emphasis will be placed on recognizing agroecology's significance as a sustainable development approach that contributes to the preservation of the traditional knowledge of the Terena people.** In this way, the research will be guided by the following question: **How did the activities developed by the GATI project contribute to the development of agroecological practices in the Cachoeirinha Indigenous Land?**

Besides the introduction and the conclusion, the study is divided into four chapters. The initial chapter provides an overview of the agroecology concept, its key definitions, and a brief description of the evolution of the agroecological movement in Latin America, with a specific focus on Brazil. It addresses, though not exhaustively, the history of civil society mobilization and social movements in the struggle to disseminate agroecology in the Brazilian agricultural landscape. The purpose of this segment is to offer a comprehensive understanding of the concept and illustrate that, due to agroecological

movements struggles, initiatives like the GATI Project could be formulated and put into action.

The second section is devoted to contextualizing the international and national background context that followed the creation of the project, showing that the State's recognition of the need for territorial and environmental management policies for Indigenous Lands was only possible due to some aspects of Brazil's historical context. In addition, it illustrates the creation process of GATI, including its objectives, results and, main activities.

The third chapter presents briefly the story of the Terena people and their relationship with agriculture. The fourth chapter is dedicated to presenting GATI's main activities conducted at the Cachoeirinha Indigenous Land and its impacts on Terena's agroecological practices. Finally, the study concludes that the GATI project was successful in boosting agroecology in this community due to the follow aspects: i) the way the project was formulated that included the locals in the whole process of development and implementation; ii) there was significant involvement and engagement of participants in all developed activities; iii) the Terena people already had a culture of agriculture, which stimulated their interest in what was being developed; iv) there was a recognition that agroecology could include the spiritual aspect of Terena culture, which they call ethnoagroecology; v) the creation of the CAIANAS organization allowed the continuity and development of other activities in the community.

The methodology of this work is based on a study case. Yin (2018) highlights a twofold definition of a case study as a research method. The first aspect is related to the scope of a study case. In this regard, a case study is an empirical method that deeply explores a contemporary phenomenon (the “case”) within its real-world context, especially when the boundaries between phenomenon and context may not be evident. Putting it in another way, to conduct a case study, the researcher aims to comprehend a real-world scenario, presuming that such comprehension is likely to encompass significant contextual factors relevant to their specific case.

The second aspect of defining case studies emerges because, in real-world situations, the distinction between the phenomenon and its context is not always clear-cut. As a result, other methodological characteristics become relevant as the features of a case study. Therefore, a case study deals with a unique situation where the number of variables of interest exceeds the available data points. As a consequence, it benefits from the preliminary establishment of theoretical propositions to inform the design, data collection, and analysis. Additionally, it relies on multiple sources of evidence, requiring data convergence in a triangulating manner (Yin, 2018).

This dual definition, encompassing both the scope and features of a case study, illustrates how case study research constitutes a comprehensive mode of inquiry. It has its own rationale for design, techniques for data collection, and distinct approaches to data analysis. In this context, it is important to note that case studies extend beyond being solely a tactic for data collection or a design feature alone (Stoecker, 1991 *apud* Yin, 2018). In this regard, this study is qualitative research with the data collection based on one single interview with a participant of the CAIANAS organization, reports and academic literature.

Case study methodology offers in-depth insights into specific cases but has constraints. Firstly, findings may lack generalizability due to the focus on singular cases. Secondly, subjectivity and bias in interpretation can affect the reliability of results. Additionally, misinterpretation risks exist due to the nuanced nature of case studies; resource-intensive nature limits accessibility; replication challenges hinder validation and reliability; ethical considerations such as confidentiality and consent require careful navigation. Lastly, confirmation bias threatens objectivity (Yin, 2018). In the case of this specific study not being able to be physically present in the territory has proven to be a constraint for the study. This limitation has restricted contact with the key individuals involved in the GATI project, as interactions have been conducted remotely.

1.0 Agroecology: a Concept Overview

The contemporary use of the term agroecology dates back to the 1930s, although the science and practice of agroecology are as ancient as the origins of agriculture. Exploring indigenous agricultural methods reveals that numerous locally evolved farming systems regularly integrate methods to adjust crops to environmental changes and safeguard them against predators and rivals (Hecht, 1999). In this sense, agroecology originated as a science applying concepts and principles from the fields of ecology and agronomy. Ecology traditionally focused on examining natural systems, while agronomy applied scientific methodologies to agricultural practices. This distinction between pure science exploring nature and applied science addressing human activities maintained a clear separation between the two disciplines, relegating agriculture to the realm of agronomy (Gliessman, 2015).

The understanding of agroecology that we have today was only possible thanks to the work of Basil M. Bentsin who can be considered the earliest agroecologist, having published research during the late 1920s and early 1930s. In Bentsin's published work, there appeared what may be the first uses of the term *agroecology*. After World War II, ecology shifted towards a more scientific pursuit of pure knowledge, whereas agronomy leaned further towards practical outcomes, mirroring agriculture's growing focus on mechanization, the utilization of agricultural chemicals, and extensive monoculture practices. Researchers in both fields gradually lost sight of shared aspects between their disciplines, leading to a widening of the gap between them. This trend continued in the 1960s with the arrival of the Green Revolution but this period was also marked by an increase in environmental awareness – about pollution of air, water, and the effects of pesticide use - among the general public which was a great input for the emergence of the agroecology in its modern form (Gliessman, 2015).

An indication of ecologists' interest in agriculture on a global scale emerged in 1974 during the inaugural International Congress of Ecology, where a working group came up with a work entitled "Analysis of Agroecosystems³." This concept of agroecosystems

³ "An **agroecosystem** is a site or integrated region of agricultural production—a farm, for example—understood as an ecosystem. The agroecosystem concept provides a framework with which to analyze food production systems as whole, including their complex sets of inputs and outputs and the interconnections of their component parts. Extended even further, agroecosystem thinking incorporates social systems—as the structures within which humans as food consumers organize food distribution through markets and other means" (Gliessman, 2015, p.21).

provided ecologists with a framework to focus their ecosystem-oriented perspectives specifically on agricultural ecosystems. At the same time, in the 1970s, agroecology began transcending the boundaries of academia, particularly in Mexico. There, a coalition composed of small-scale farmers, peasants, activists, and scientists, unified in their opposition to the transformative impacts of the Green Revolution, embraced the agroecosystem concept. They advocated for preserving Mexico's traditional, local, and indigenous systems, contending that these balanced agroecosystems, which had served the needs of millions of small farmers for centuries, should not be discarded in favor of high-yielding yet input-intensive technologies. They argued that these traditional agroecosystems represented instances of coevolution among ecological, technological, and socioeconomic elements and deserved recognition. From then on, agroecology adopted a facet linked to social movements, a characteristic it retained, alongside a strong emphasis on the ecological underpinnings of traditional farming systems in developing nations (Gliessman, 2013). Scholars spanning various fields began acknowledging that traditional agriculture offered valuable models of ecologically grounded management of agroecosystems (Gliessman, 2015).

In the early 1980s, agroecology emerged as a methodology and as a distinct conceptual framework for the study of agroecosystems. This period was strongly influenced by studies on cropping systems and traditional knowledge in developing countries, which were increasingly recognized as important examples of ecologically grounded agroecosystem management. During the 1990s, agroecology matured into a well-recognized approach for the conversion to sustainable agriculture. Agroecological research approaches emerged, several textbooks were published, and academic research and education programs were put into motion (Gliessman, 2015). From the 2000s onward, influenced by the European school of thought, agroecology started emphasizing a more sociological view of agroecosystems, encompassing new dimensions beyond the ecological and technical-agronomic aspects, such as socio-economic, cultural, and sociopolitical elements (Casado, González de Molina, and Guzmán, 2000).

Moreover, agroecology could no longer limit its focus to just crops, livestock, and agricultural lands. The entirety of the food system, spanning from seeds and soil to the dining table, demanded attention. There was a widespread acknowledgment that farmers, consumers, and every actor in between constituted an interconnected system.

Alongside this food-system perspective, a parallel movement emerged within the social sciences related to agroecology (Guzmán-Casado *et al.*, 1999). Professionals such as rural sociologists, anthropologists, ethnobotanists, and others operating within the agroecological framework stressed the critical need to address the growing disparities and injustices stemming from the commercialization of food and the industrialization of agriculture. They highlighted that tackling issues of hunger, poverty, and supporting small-scale farmers globally not only aligned with establishing a more ecologically sustainable approach to agriculture but was also an imperative component of achieving that objective (Sevilla-Guzmán, 2006).

The term agroecology focuses on human needs to guide agriculture toward sustainability, in its multidimensional sense. In a broader view, it materializes when it encompasses, simultaneously, aspects of economic sustainability (income potential and employment, market access), ecological sustainability (maintenance or improvement of the quality of natural resources and ecological relationships within each ecosystem), social sustainability (inclusion of the poorest populations and food security), cultural sustainability (respect for traditional cultures), political sustainability (organization for change and participation in decisions), and ethical sustainability (transcendent moral values) (Embrapa, 2006).

Gliessman (2000) sees agroecology as stemming from ecology and agronomy, heavily influenced by traditional farming systems—especially indigenous and peasant communities—in developing countries. He considers agroecology as an emerging science, guided by a new epistemological and methodological foundation. It is a transdisciplinary field of knowledge, influenced by social, agricultural, and natural sciences, especially Applied Ecology. Due to its strong connection to ancestral sources of knowledge, agroecology values popular knowledge as a source of information for models that may hold validity in current conditions. This appreciation for such knowledge does not discredit the findings of the classical scientific method; instead, it acknowledges the significant importance of both sources and the positive relationship between them. In this sense, agroecology is grounded in the synergistic relationship between the evolution of scientific knowledge and traditional wisdom, emphasizing their necessary integration.

Accordingly, agroecology can be understood as a scientific approach that examines agriculture not only in terms of maximizing production but also taking into account the influences of sociocultural, political, economic, and ecological aspects within the scope of the food system and rural development – has grown as a new paradigm capable of seeking the scientific foundations of agricultural sustainability through interdisciplinary integration (Embrapa, 2006).

Altieri (2004) presents a more technical definition in which sustainable production in an agroecosystem derives from the balance between plants, soils, nutrients, sunlight, moisture, and other coexisting organisms. The agroecosystem is productive and healthy when these rich and balanced growth conditions prevail, and when plants remain resilient enough to tolerate stresses and adversities. Periodic disturbances can be overcome by vigorous agroecosystems that are adaptable and diversified enough to recover the periods of stress. Occasionally, farmers employing alternative methods may have to apply more drastic measures (such as botanical insecticides, and alternative fertilizers) to control specific pests or soil deficiencies. Therefore, the author argues that agroecology encompasses guidelines on how to do this carefully, without causing unnecessary or irreparable damage. Beyond battling pests, diseases, or soil issues, agroecologists seek to restore the resilience and strength of the agroecosystem. If the cause of the disease, pests, or soil degradation, for example, is understood as an imbalance, then agroecological treatment aims to restore it. The treatment and recovery are guided by a set of specific principles and technological guidelines.

These guidelines involve such elements for an agroecological strategy: "i) Conservation and regeneration of natural resources – soil, water, genetic resources, and beneficial fauna and flora; ii) Management of productive resources – diversification, recycling of nutrients and organic matter, and biotic regulation; and iii) Implementation of technical elements – definition of ecological techniques, work scale, integration of system elements in focus, and adaptation to farmers' rationality." An approach grounded in agroecology encourages researchers to explore farmers' knowledge and methods, aiming to cultivate agroecosystems requiring minimal reliance on external agrochemicals and energy resources. The objective is to foster and support complex agricultural systems in which ecological interactions and synergies among biological components themselves create soil fertility, productivity, and crop protection (Altieri, 2004, p.25).

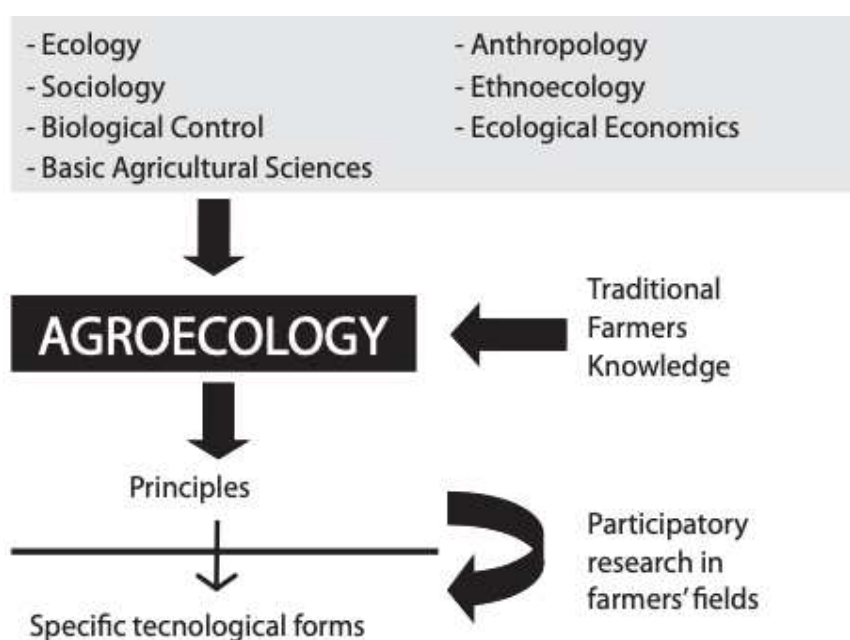
Nevertheless, restoring ecological health is not the only objective of agroecology. In fact, sustainability is not possible without preserving the cultural diversity that sustains local agriculture. The study of ethnoscience⁴ has revealed that local people possess highly detailed knowledge about the environment, vegetation, animals, and soils. Peasant knowledge about ecosystems often results in multidimensional productive strategies for land use, within certain ecological and technical boundaries, fostering self-sufficiency in food for communities within specific regions (Toledo *et al.*, 1985).

For agroecologists, various aspects of traditional knowledge systems are particularly relevant, encompassing agricultural practices, knowledge of the physical environment, popular taxonomic systems, and the use of low-input technologies. Many scientists in developed countries started to show interest in traditional agriculture in its various facets: the ability to tolerate risks, productive efficiency of symbiotic crop mixtures, material recycling, utilization of local resources and germplasms, and the skill to exploit a range of microenvironments. Through the study of traditional agriculture, valuable information can be obtained that can be used in developing appropriate agricultural strategies tailored to the needs, preferences, and resource base of specific groups of farmers and regional agroecosystems (Altieri, 1983).

Therefore, Roset and Altieri (2021) stress that agroecology combines indigenous knowledge systems regarding soils, plants, and so on with modern ecological and agricultural science disciplines. By promoting a dialogue of different knowledge and integrating elements of modern science and ethnoscience, a series of principles emerge. When implemented in a specific region, these principles manifest in varied technological forms based on the socioeconomic, cultural, and environmental contexts, as exemplified in fig.1 Thus, agroecology does not advocate for rigid technical instructions but rather emphasizes principles; it is focused on inputs rather than processes. For the technologies derived from these principles to meet the needs and situations of small-scale farmers, the process of technological development ideally involves participatory or farmer-led research in which in collaboration with researchers can create innovative solutions.

⁴ The knowledge system of a naturally originated local ethnic group (Toledo *et al.*, 1985).

Fig.1. The principles of Agroecology.



Source: Rosset, Altieri (2021, p.9)

Agroecology also encompasses a significant dimension devoted to studies focused on rural development. The examination of the, often negative, consequences arising from the increased integration of local communities with national and global economies has been crucial in comprehensively evaluating the social and environmental impacts. At the same time, development research aspects such as appropriate technologies, changes in crop distribution, land tenure, etc., and even the criticism formulated against economic growth as a form of development have been of special importance in claiming the sustainable nature of rural development, not only from an environmental perspective but also, and inseparably, from a social and economic point of view. The criticism made of technological diffusion methods and agricultural extensionism that accompanied the 'green revolution' has helped clarify many of the flaws of conventional economic and agricultural thinking from ecological, technological, and social perspectives simultaneously (Casado, Molina and Guzman, 2000)

Therefore, Casado, Molina, and Guzman (2000) highlight that a definitive inference drawn from these studies emphasizes the centrality of peasants and small-scale farmers must be from the beginning and end of all extension work. Technicians, in this regard, should merely serve as catalysts, fostering a developmental process stemming

organically from within rural communities. This profound shift in focus has led to the acknowledgment of the extensive and diverse knowledge in botany, entomology, soil science, and more, harbored by peasants, proving invaluable in designing sustainable rural development strategies.

In this approach, farmers take charge of shaping their own progress. Agroecology supports this by equipping communities with methodological tools for authentic community participation, empowering them as central figures and decision-makers in steering processes of change and societal transformation (Caporal and Costabeber, 2002). Agroecology has reclaimed an agricultural heritage that had been destroyed by modern agriculture and particularly by agronomic sciences that, often laden with biases related to class, ethnicity, culture, and gender, had disregarded the body of knowledge and the people who produced and transmitted it (Hecht, 1999).

Among the principles that support agroecological practice is food sovereignty, which recognizes the right of peoples and communities to define their strategies for the production and consumption of the necessary food. Agroecology, as a productive mode, plays an important role in Food and Nutritional Security, especially in small family properties (Sambuichi *et al.*, 2017). By employing agroecological methods, the productivity and sustainability of small traditional farms can be enhanced, potentially serving as the foundation for food sovereignty. This concept entails the entitlement of each nation or region to uphold and enhance its ability to cultivate essential food crops, embracing both productive and cultural diversity. The evolving idea of food sovereignty places significant emphasis on ensuring farmers' access to land, seeds, and water, emphasizing local autonomy, indigenous markets, local production-consumption cycles, sovereignty over energy and technology, and fostering networks among farmers (Altieri, 2009).

According to Altieri (2009), several studies have shown that small-scale farmers have the capacity to generate a significant portion of required food for both rural and urban communities despite the challenges posed by climate change and rising energy expenses. Innovative agroecological methods and technologies led by farmers, non-governmental organizations (NGOs), and certain local administrations worldwide are currently playing a substantial role in ensuring food security at household, national,

and regional scales. Diverse agroecological and participatory methods implemented across various nations demonstrate highly favorable results, even in the face of challenging environmental circumstances.

Another strong component in agroecological practice is gender equity, based on recognizing the significant role women have played in the movement's expansion. Within family production, women traditionally develop more agroecological systems, in vegetable gardens, orchards, small animal husbandry, and the home processing of products, ensuring the quality of the food consumed by the family (Siliprandi, 2013).

A more recent approach puts a political dimension at the center of agroecology. The political turn (Anderson *et al.*, 2019, González de Molina *et al.*, 2020; Val *et al.*, 2019; Giraldo and McCune 2019) is characterized by the focus on the political and institutional aspects of agroecology, covering the entire food system (López-García, González de Molina, 2021). Agroecology transitions to sustainable food systems require the reconstruction of food metabolisms, territorial flows, plural subjects, and governance arrangements (González de Molina, 2012). Agroecology is not only the ecology of food systems but also has a fundamentally political dimension, aspiring towards autonomy and self-organization for sustainability and social justice (Anderson *et al.*, 2019).

González de Molina *et al.* (2020) argue that the dominant food regime is unable to nourish the whole population even though there is enough raw harvest to do so. The sole feasible solution involves constructing a significantly different food system, founded on sustainable methods of production, processing, distribution, and consumption. The diverse range of agroecological practices experienced worldwide serves as the foundation for this alternative food system. However, the biggest challenge of agroecology is to scale up both horizontally (scaling out) and vertically (scaling up). Indeed, most agroecological practices, aligned with social movements, NGOs, academic institutions, and to a lesser extent, governments, are primarily limited to farm or community contexts. In this regard, the authors explain that to scale out and up, it is essential to change the institutional framework that is currently maintaining the corporate food regime and this change must be political.

Nonetheless, there is a notable lack of political initiatives within agroecological movements that extend beyond the local level. This deficiency stems from the incomplete recognition of the essential connection between agroecology and politics, necessary for both the development and widespread adoption of agroecological practices. Thus, the pursuit of sustainable agricultural ecosystems requires Political Agroecology, a new approach to organizing agroecosystems and agricultural processes overall. Similar to how political power coordinates various components within a socio-environmental system, Political Agroecology should manage the different subsystems of an agroecosystem by regulating energy, material, and information flows. Its responsibility lies in guiding and structuring the evolution of agroecosystems, ensuring continuity and coherence in their development (González de Molina *et al.*, 2020; González de Molina, 2012).

Following this approach, the food regime transition could be understood as a process of shifting from one institutional framework to a qualitatively different one. Such a transition implies major changes, and not simple readjustments or improvements. It means attaining a new, qualitatively different food regime (González de Molina *et al.*, 2020). Gliessman (2015, 2016) has outlined five phases in transitioning towards more sustainable food systems through agroecology. The initial three phases focus on the agroecosystem level, comprising: (i) enhancing input efficiency; (ii) replacing conventional inputs and practices with agroecological alternatives; and (iii) restructuring the agroecosystem based on new ecological processes. The remaining two phases extend across the entire food system, involving: (iv) re-establishing direct producer-consumer connections; and (v) constructing a new global food system emphasizing participation, locality, fairness, and justice. While the first two phases involve gradual changes, the latter three are characterized by more profound transformations.

Besides that, there is also an approach advocating for a synergy between agroecology, and technological and geographical approaches in fostering sustainable food systems. Technological advancements, such as precision agriculture, remote sensing, and digital farming platforms, can bolster agroecological principles like biodiversity enhancement,

soil health improvement, and resource efficiency in agriculture. These technological tools are seen as integral components in supporting agroecology's aims of promoting sustainable food production and distribution. However, there are some challenges associated with integrating technology into agroecological systems, including issues of accessibility, affordability, and scalability (De Marchi, Pappalardo and Diantini, 2022).

Moreover, De Marchi and Diantini (2022) highlight the significance of Participatory Geographic Information Science (PGIS) in empowering communities to transition towards sustainable agricultural practices. PGIS, which combines geographical tools and local knowledge, enables communities to collect, analyze, and utilize geographic data in decision-making processes related to agroecology. It is emphasized that community involvement and collaboration are crucial in leveraging PGIS effectively to address environmental and social challenges in agriculture.

Although there exist diverse definitions and practical applications associated with agroecology, there are crucial points of agreement, one being the resistance to the agricultural model established by the Green Revolution and the advocacy for employing natural and biological processes in agricultural production (Norder *et al.*, 2019). In this context, the application of agroecology's concepts and principles triggered the global emergence of the agroecological movement. This movement offered a fresh perspective to alternative agricultural movements and intertwined with grassroots social initiatives. Embracing cultural and biological diversity, agroecological practices seek to safeguard and revive heritage crop varieties and the traditional knowledge of local communities (Embrapa, 2006).

Unlike the conventional diffusion method reliant on 'technological packages,' agroecological knowledge spreads through communal exchange and interaction, fostering participatory engagement (Caporal and Costabeber, 2004). This growth is nurtured by local networks of innovation, connecting farmers, extension workers, researchers, and diverse organizational forms, collectively known as agroecology networks (Finatto, 2016). The aim is not to standardize techniques but to cultivate the notion of an agroecological transition—a gradual process of transforming and adapting

agricultural practices toward a more sustainable system (Costabeber and Moyano, 2000).

1.1 Agroecology in Latin America

Conventional farming methods have served as the cultural and historical foundation for fostering and expanding agroecological initiatives. Since the 1980s, numerous projects centered around agroecology have been advocated by NGOs and subsequently by farming groups. These initiatives blend traditional knowledge with contemporary agricultural science (Altieri, Rosset, Thrupp, 1998). By the early 20th century, the recognition of the environmental and communal benefits offered by indigenous farming techniques, alongside the role of small-scale farming in ensuring food security amid global challenges like climate change, economic instability, and energy crises, significantly stimulated the ideals of food sovereignty and agroecology-based farming systems (De Schutter, 2010).

Latin America and the Caribbean stand as particularly propitious environments for the rise and growth of alternative food and production models focused on tackling environmental, social, economic, and public health challenges (Le Coq *et al.*, 2020). During colonial times, agroecology was left apart giving space for the imposed institution of *latifundios*, a feudal system created by colonial powers, based on monocultures (Hecht, 1999). For centuries, a significant part of the New World, mainly composed of indigenous and African people, were subjected to slavery work in monoculture plantation *latifundios*. The historical experiences of a dominant ‘Western agriculture’ in opposition to ‘Traditional Latin agriculture’ profoundly shape the dynamic between peasants, indigenous groups, rural laborers, and Afro-descendant communities in Latin America and their relationship with agricultural practices (La Via Campesina, 2013).

The twentieth-century resistance against the *latifundio* system has resulted in renewed land access through land occupations and limited land reforms, empowering farmers to reclaim their knowledge systems. In Latin America, agroecology often confronts the socioeconomic structure underlying agriculture by recognizing the imperative to move beyond the property relations of the *latifundio* (McCune *et al.*, 2017). Apart from the scars left by this colonial period, this region is threatened by the contradictions and

overreach of conventional agriculture stemming from the Green Revolution which has been adopted in the form of agroindustrial production models that frequently exhibit minimal regard for the environment, operating within a regulatory framework considerably less stringent than those in Europe and North America (Le Coq *et al.*, 2020).

Therefore, the expansion of agroecology across Latin America has started an evolution involving cognitive, technological, and socio-political innovations, intertwined with shifting political landscapes, such as the rise of progressive governments and the resilience of peasant and indigenous movements. Consequently, agroecology's emerging scientific and technological framework is evolving in line with social movements and political processes (Altieri and Toledo, 2011). Latin American agroecology is “largely seen as being part of a relationship that involves knowledge, land, and political power” (Rosset *et al.*, 2021, p.8).

The technological aspect of the agroecological revolution differs from the Green Revolution's emphasis on standardized seed-chemical packages and “magic-bullet recipes”; agroecology operates on principles adaptable to various technological manifestations that cater to the diverse socio-economic needs of farmers and their unique environmental conditions. Innovations in agroecology organically arise on-site, engaging farmers in a horizontally collaborative process. These technologies reject standardization, embracing flexibility and responsiveness to each particular context (Altieri and Toledo, 2011).

Many learning innovations have characterized the agroecological revolution in Latin America according to Ruiz-Rosado (2006) and Toledo (1995), such as the understanding that agroecology integrates natural and social processes joining political ecology, ecological economics, and ethnoecology among the different disciplines; agroecology employs a holistic approach, therefore, it has long been considered as a transdisciplinary as it integrates the advances and methods of several other fields of knowledge; agroecology is not neutral and is self-reflexive, giving rise to a critique of the conventional agricultural paradigm; it also recognizes and values local knowledge and traditions, creating a dialogue with local actors via participatory research that leads to a constant creation of new knowledge; agroecology adopts a long-term vision that sharply contrasts with the short-term and atomistic view of conventional agronomy;

and, finally, agroecology is a science that carries ecological and social ethics with a research agenda of creating nature-friendly and socially just production systems.

In this regard, taking into account the specificities of the Latin American context and the characteristics of agroecology in the region, Rosset *et al.* (2021), argue in favor of the existence of a *Latin American agroecological thought*. The authors illustrate that Latin American agroecology can be condensed into three main features. The first one is related to “*Agri-culture*” and ancestralism which means the ancestral relationship between human beings and their environment. The sustainable management of agroecosystems achieved through agricultural practices that prioritize biodiversity conservation and the preservation of natural resources, stems from an agricultural heritage rooted in the co-evolution and co-creation of landscapes.

The second aspect lies in the high degree of politicization and organization of Latin American rural movements. Within the region, agroecology has been forged amidst ongoing struggles for land and territory, evolving into a form of resistance against the invasions on territories driven by neoliberal globalization. Moreover, the Latin American agroecological movement can develop multi-level organizational processes, in dialogue and articulation with broad sectors, ranging from academia to all sorts of social movements (Rosset *et al.*, 2021).

Finally, the last point proposed by the authors is related to the processes of training and formation. There is a meaningful connection between the local, vernacular and ancestral knowledge of indigenous and peasant communities and technical, scientific and academic knowledge, and their mutual feedback from the exchange of experiences and the *diálogo de saberes* (Martínez-Torres and Rosset, 2014) .

The institutional acceptance of agroecology in Latin America did not result in the establishment of specific criteria to meet market demands. Its integration into the policies of various countries in the region was not done uniquely. In Cuba, for instance, agroecology initially emerged as a response to the crises faced by conventional agriculture due to the United States embargo and later the collapse of the Soviet Union. Over time, it evolved into a proactive system driven by a group of researchers, rural movements, and urban agriculture initiatives. Even though the term 'agroecology' is not

explicitly mentioned in existing policies, the fundamental principles of Latin American agroecology are intertwined with the country's policies regarding food security, sovereignty, nutrition, and health. These underlying agroecological principles significantly influence a range of public policies, particularly various public programs such as those focused on organic pest control, urban and peri-urban agriculture, as well as technical assistance (Vázquez, Marzin, González, 2017).

In other countries, this institutional recognition materialized through the establishment of explicit national policies aimed at advancing agroecology. For instance, Brazil introduced the 2012 National Policy on Agroecology and Organic Production, while Nicaragua enacted a law dedicated to agroecology in 2011. Additionally, the concept of agroecology has made it present in other countries across the region, such as Mexico, even though to a lesser extent in Argentina, Chile, and Costa Rica, where it is commonly associated with the restoration of small-scale farming and preservation of indigenous traditions. It is often seen practices such as crop associations and communal forms of production and living, embracing the notion of *buen vivir*⁵. However, in countries where the dominance of the agro-industrial model persists, agroecology has not been the focal point of specific policies (Le Coq *et al.*, 2020).

Le Coq *et al.* (2020) identify three main processes that made possible the development of the agroecology agenda and the formulation of public policies in Latin America. They are: i) a response to a geopolitical, economic or environmental crisis; ii) public initiatives; and iii) mobilization of social movements.

To begin with, the authors argue that the first process relates to exploring ways to respond to geopolitical, economic, or environmental crises. For instance, certain nations (such as Cuba, Argentina, and Nicaragua) embarked on the path of agroecological transition due to the crisis impacting traditional agriculture. In Cuba, the adoption of agroecological practices serves as a direct response to the geopolitical crisis of 1993(Le Coq *et al.*, 2020).

⁵ *Buen vivir* is a concept created in the Andean countries that is based on a society where humans coexist with each other and with nature. It draws inspiration from various realms, ranging from intellectual reflection to civic practices, and from indigenous traditions to alternative academia. See more in Gudynas and Acosta (2011).

Similarly to Cuba, Nicaragua embraced agroecology not only in response to the scarcity of chemical inputs during the conflicts of the 1980s but also as an alternative to the dominance of the agro-industrial capitalist model between 1960 and 1970. The promotion of agroecology also emerged as a response to severe environmental crises impacting the cotton agri-export model. Additionally, it was a reaction to climate-related emergencies, such as the one caused by Hurricane Mitch in 1998, which isolated many parts of the country, depriving numerous farmers of access to chemical inputs (Fréguin-Gresh, 2017).

In Argentina, the financial crisis in the late 1980s, marked by hyperinflation, motivated the introduction of policies aimed at supporting disadvantaged populations across rural, peri-urban, and urban areas. It also led to the establishment of the *Prohuerta* program. Launched in 1990, this initiative aimed to promote vegetable production for self-consumption through a participatory approach, facilitating access to seeds, water, and markets (such as farmers' markets) for urban and peri-urban producers. Eventually, following the financial crisis of 2000-2001, this program expanded its reach to rural regions (Patrouilleau, Martínez, Cittadini, Cittadini, 2017).

The second process is related to initiatives conducted by governmental authorities. In several countries like Mexico, Chile, and Costa Rica, policies for transitioning to agroecology primarily stem from governmental proposals promoting sustainable agriculture. These actions were a response to both social and international pressures regarding environmental standards. For instance, Mexico introduced the Sustainable Rural Development Act of 2001, while Costa Rica implemented the Sustainable Agriculture Promotion Act of 2002 (Le Coq *et al.*, 2020)

These policies serve to endorse organic agriculture or advocate for agroecological methods. This is evident in Chile, where these practices were integrated into the Agricultural Development Institute's technical support and investment subsidy programs. Additionally, an alternative certification system was incorporated into the organic agriculture law, enabling small family farmers to market their organic produce through various outlets (Martínez Torres, Namdar-Iraní, Saa Isamit, 2017). Likewise, in Costa Rica, a law promoting organic agriculture emerged in 2007 which was facilitated by the Organic Agriculture Movement and supported by Ministry of Agriculture officials. This led to the establishment, in 2013, of a ministry program recognizing

environmental benefits that encouraged the adoption of practices in agri-environmental and organic agriculture (Sáenz-Segura, Le Coq, Bonin, 2017).

Finally, the third process refers to the mobilization of social movements advocating for organic agriculture or agroecology, in collaboration with representatives and supporters of family or peasant farming, and with the assistance of international technical cooperation bodies. These policies were not only formulated at the national level, as seen in Brazil and Nicaragua, but also at regional levels, such as in Chile and El Salvador. In Nicaragua, the enactment of the 2011 law promoting agroecology and organic agriculture was the culmination of a decade-long struggle led by a diverse coalition of social movements and activist unions championing agroecology, organic farming, and the defense of rural communities. This coalition collaborated with academics, and government officials, and received support from international cooperation bodies (Fréguin-Gresh, 2017).

In Chile, responding to the demands of agroecology movements formed by farming organizations, an agroecology committee coordinated by the Agrarian Development Institute was established (Martínez Torres, Namdar-Irani, Saa Isamit, 2017). Meanwhile, in El Salvador, the development of the agroecology promotion policy presented to the government in 2017 was a result of a collaborative effort among a coalition of NGOs and various advocacy groups supporting agroecology. They worked in cooperation with the Rural Dialogue Group and the National Committee for Family Farming (Moran, 2017).

Even though all these above-mentioned advancements have proved to be important for the implementation of the agroecological agenda and its inclusion into public policies in Latin America, Giraldo and Rosset (2023) argue that progressive governments have been promoting what they call “reformist agroecologies”. These agroecologies are based on the idea that since a revolution or radical change is deemed unreachable, the approach is to effect small, incremental changes within the existing institutional frameworks, gradually advancing the goals of the agroecology movement step by step.

The concept of "reformist agroecologies" aims to scrutinize various initiatives of progressive governments, NGOs, and international cooperation agencies. While these initiatives may not be as strongly market-oriented as "neoliberal" agroecologies, they

often follow a top-down approach in design and implementation. Consequently, they can suppress peasant initiative, leadership, and empowerment, while fostering dependency. To overcome this challenge they introduce the concept of ‘emancipatory agroecologies’ to refer to those radically transformative processes that take place within collective struggle (see more in Giraldo and Rosset, 2023).

1.1.1 The agroecological movement in Brazil

In 2012, the National Policy for Agroecology and Organic Production (Pnapo in Portuguese) was established, with its primary objective being the integration, coordination, and adaptation of various government policies, programs, and initiatives to promote the transition to agroecology and support organic and agroecological production. This policy was designed to foster the sustainable production of healthy food while aligning rural development with natural resource conservation and preserving the knowledge held by traditional communities (Moura, 2016).

However, the social mobilization that led to the creation of this policy began in the 1970s through the efforts of Base Ecclesial Communities and the alternative agriculture movements, as will be better clarified in the following explanation. The agroecology and organic production agenda gradually became part of the platform of peasant social movements, serving as a means of resistance to the agricultural modernization model propagated by the Green Revolution (Moura, 2016; Sambuichi *et al.*, 2017).

Brandenburg (2002) highlights that the practical foundations for ecological agriculture already existed before the Modernization Era. European immigrants have introduced production systems based on the management of natural resources stemming from the First Agricultural Revolution but were marginalized by modernization policies. The social movements advocating for alternative forms of agriculture have emerged in reaction to the exclusionary aspects of agricultural modernization policies, leading to a response from family farmer groups who were left out of the benefits of government subsidies, agricultural loans, and other services offered by public institutions intended to guide and assist farmers.

From a technical perspective, these movements endeavored to revitalize traditional practices already well-known to farmers, aiming to formulate a set of strategies that

would support the ongoing existence of farmers in rural areas. Alternative agriculture serves as a means of survival for family farmers and represents the re-establishment of a socio-environmental connection deeply rooted in the rural way of life. In this sense, as stated by Brandenburg (2002, p.13), "the agroecological movement is a counter-movement against the dominance of industrial production logic."

Moreover, the agricultural modernization widely embraced in Brazil from the 1960s onwards relied heavily on the extensive application of industrial technologies, including chemical fertilizers, pesticides, heavy machinery, and genetically modified seeds. Similar to the process of an industrial assembly line, agriculture followed a trajectory of specialization, promoting genetically uniform monocultures that, through the intensive use of chemical and industrial inputs, aimed to maximize production. Nevertheless, this modernization process began to be heavily criticized for its environmental and social impacts (Balsan, 2007; Sambuichi *et al.*, 2012).

Although these modernization efforts have contributed to the expansion of commodity production and the growth of Brazilian Gross Domestic Product (GDP) and exports, proving to be highly lucrative for agribusiness sectors and the financial system, this production system came with negative externalities for societal well-being. Monocultures, for instance, typically have a detrimental impact on the environment as they reduce agroecosystem biodiversity, diminish their stability, and render them more susceptible to pest infestations, diseases, and soil fertility reduction. This implies the increasingly extensive and potentially harmful use of pesticides and chemical fertilizers, which not only pose a potential risk to human health but can also result in water and soil pollution, ultimately causing a loss of biodiversity and a decline in ecosystem services (Sambuichi *et al.*, 2012).

Beyond that, Silva (1982) and Sambuichi *et al.* (2017) point out that the principal disadvantage of this modernization model is that it failed to foster inclusive and equitable development for traditional populations in rural and forest areas, stripping them of their autonomy and the economic and sociopolitical conditions necessary to maintain their territories, culture, and way of life. Instead, it favored land concentration, poverty, and rural outmigration. A significant number of small to medium-sized farmers, who did not have the same resources for investing in high technology and were frequently considered to have low productivity and profitability, making them unable to

thrive in the competitive market, found themselves marginalized. Consequently, a segment of the rural population was forced to move to urban areas seeking to escape poverty.

The 1970s, under the rule of the Military Dictatorship (1964-1985), was a period marked by brutal repression against movements advocating for agrarian reform. Spaces, where peasant families could gather and reflect on their realities and seek ways to confront their condition of deprivation, started to emerge within Catholic and certain Protestant churches, such as the Base Ecclesial Communities. These intuitions had a significant influence in rural areas and organized their actions based on families' daily lives, connecting them to broader dimensions related to resistance against the hegemonic model of rural development (Monteiro and Londres, 2017).

Therefore, farmers rediscovered the Church not only as a space for the expression and renewal of religious faith but also as a place for critical and systematic reflection on the social, political, and economic obstacles. This collective experience and reflection were facilitated through the "see-judge-act" method, a dialectical approach that emphasizes linking concrete practices of everyday life with a critical interpretation of the bible (Petersen, 2007).

Many of the technical alternatives now embraced in agroecology were advocated by the Base Ecclesial Communities. For instance, practices such as the use of organic fertilization, green manure, and other soil conservation techniques, the appreciation of medicinal plants, and natural methods for pest and disease control were promoted. On the organizational front, collective processes and mutual aid for resource management and service execution were encouraged. This included initiatives like communal milling facilities, community seed banks, collective farms, communal work efforts, and other forms of association. The promotion of family self-consumption production was also prominently featured, aiming to reduce dependence on markets and foster pesticide-free nutrition. "It was precisely through the appreciation of these local socio-political organizing environments created by the Base Ecclesial Communities that the 'agroecological movement' in Brazil took its initial steps (Petersen and Almeida, 2006). Many leaders and NGOs that emerged from these religious communities played crucial roles in building nationally influential social movements and revitalizing the labor movement for rural workers (Monteiro and Londres, 2017).

Furthermore, throughout the 1970s, a series of global events had a significant impact on the ecological concerns within Brazilian agriculture. Notably, Rachel Carson's book, "Silent Spring," published in 1968 was the first work to point out the impasses with the use of pesticides in the USA, confirming the negative effects of insecticides on animals. In 1972, the Club of Rome released its report, whose main conclusion was that on Planet Earth there were not enough raw materials and energy for the entire population to adopt the consumption patterns then predominant in developed countries (Meadows, 1972).

In the second half of the 1970s, the first events on alternative agriculture were organized, and promoted by professional entities and agronomy students. The term "alternative agriculture" was assumed to encompass the different currents of opposition to the dominant model: biological, natural, permaculture, organic, and biodynamic agriculture, among others. Additionally, the work of Ana Maria Primavesi (Primavesi 1979), "*Manejo ecológico do solo: a agricultura em regiões tropicais*," also provided technical and scientific support to the alternative agriculture movement (Costa *et al.*, 2015).

The 1980s, characterized by democratic openings following the end of the Military Dictatorship, enabled a better organization of popular movements and facilitated the establishment of support entities for farmers. Additionally, it fostered the creation of national forums for discussion and reflection, since the Federal Constitution of 1988 enabled the expansion of participatory institutions. Noticeably, the creation of the National Council for Food Security and Nutrition and the establishment of the National Council for Sustainable Rural Development. At the same time, this period witnessed the strong emergence of movements opposing the industrialization of agriculture and its negative ecological impacts. There was a growing realization that the technological package of the Green Revolution, promoted by public policies, created dependence among farmers on powerful agro-industrial complexes. Particularly notable were the substantial protests in the 1980s against pesticides, involving prominent figures in agronomy and culminating in the approval of the Pesticide Law in 1989. This legislation incorporated noteworthy advancements, including the official adoption of the

term "pesticide" in place of the euphemism "agricultural defense" (Londres, 2011; Petersen and Almeida, 2006).

Throughout this decade, there was also a strong influence, especially among professionals and students in agricultural sciences, from the ideas of researchers from various parts of the world who contested the assumptions of the Green Revolution and proposed alternatives based on ecological visions of agriculture. A significant milestone was the publication in 1989 in Brazil of the book "Agroecology: Scientific Foundations for Alternative Agriculture" by the Chilean agronomist Miguel Altieri. Notably, the dominance of the Green Revolution in media, universities, and research institutions resulted in these individuals facing derogatory labels and accusations. They were often accused of promoting an agriculturally backward approach, deemed incapable of meeting the demands for large-scale urban population supply (Monteiro and Londres, 2017).

The concept of alternative agriculture started gaining ground among an increasing number of professionals and students in agrarian sciences, leading to the formation of the Brazilian Alternative Agriculture Movement, primarily comprising agronomists at that time. Moreover, additional NGOs emerged, focusing on alternative agriculture and extending their involvement to various areas such as technical support and marketing. These NGOs also began working with diverse categories of farmers, including groups like the Association of Agriculture. In 1983, the Alternative Technologies Project was established under the Federation of Organizations for Social and Economic Assistance, later evolving into the Advisory and Services for Projects in Alternative Agriculture (Costa *et al.*, 2015; Sambuichi *et al.*, 2017).

These groups engaged in expanding initiatives across different regions of the country gathered in Curitiba, Paraná, in 1981, at the 1st Brazilian Meeting on Alternative Agriculture (BMAA). Throughout the 1980s, three more BMAs were held: in 1984 in Petrópolis, Rio de Janeiro; in 1987 in Cuiabá, Mato Grosso; and in 1989 in Porto Alegre, Rio Grande do Sul. These meetings were undoubtedly an expression of the initial efforts to establish a large-scale national movement bringing together different

groups and sectors of society involved in building alternative agriculture in the country (Sambuichi *et al.*, 2017).

Moving to the 1990s, the focus shifted towards environmental concerns, driven by discussions surrounding the United Nations Conference on Environment and Development, commonly known as Rio-92. Factors such as concern for environmental degradation, coupled with the global expansion of organic production and the consolidation and growth of productive experiences in Brazil, contributed to the expansion of agroecology in that decade. From the Rio-92 onward, it can be considered that certain principles and guidelines of agroecology began to have an impact on the development of public policies. For instance, the creation of the Small Projects Program (SPP), funded by the Global Environment Facility (GEF), supporting initiatives in the Brazilian Cerrado; and the Demonstrative Projects Subprogram (DPS), linked to the Pilot Program for the Protection of Brazil's Tropical Forests (PPG7), funded by European international cooperation agencies which supported projects developed by farmer organizations and advisory entities in the Atlantic Forest and Amazon biomes (Monteiro and Londres, 2017), some of which will be better explained in the next chapter about the GATI Project.

During this period, the principles of agroecology started to be integrated into discussions and embraced by numerous NGOs collaborating with rural social movements, given the relevance and alignment of these principles with the socio-cultural and environmental context of Brazilian family farmers (Costa *et al.*, 2015). Inspired by the experience of the *Campesino a Campesino*⁶ Movement in Central America, agroecological innovation networks also began promoting farmer-to-farmer exchanges. This method of horizontal communication enhanced the social processes of agroecological innovation. Throughout the 1990s and early 2000s, the intensification of experimentation processes at the local level, along with the strengthening of family farming organizations and traditional communities, and the growth of advocacy struggles by rural social movements, gave rise to regionally-reaching networks. For instance, the Brazilian Semi-Arid Articulation and, in southern Brazil, the Ecovida

⁶ The *Campesino a Campesino* Movement is an approach to learning and exchanging knowledge in agriculture, where farmers share agricultural practices and techniques with each other. It emerged in Central America in the 1970s, mainly in countries such as Honduras, Guatemala and Nicaragua (Tucher, 1995).

Participatory Certification Network (now known as the Ecovida Agroecology Network) (Sambuichi *et al.*, 2017).

The 1990s were also marked by strong mobilization in the struggle for land, led by the Landless Workers' Movement and the labor movement. Many settlements were established during this period. Often in remote and already heavily degraded areas previously owned by large landowners, the settled families faced significant challenges in organizing productive systems. This situation prompted the movements to initiate a process of critical reflection on the productive and technological model promoted within the settlements and to seek alternatives (Sambuichi *et al.*, 2017).

Nonetheless, it was only from 2003, with the beginning of President Lula's (2003-2010; 2022-present) government, that spaces for dialogue between the federal government and civil society were established, and many of the demands of the agroecological movement began to be included in the guidelines of public policies⁷. Local networks of agroecological innovation began to receive more systematic support from various public policies and programs, contributing to their development. This is evident in the expansion of access to social security benefits for rural workers, the appreciation of the minimum wage, the *Bolsa Família* Program⁸, the improvement of infrastructure in rural communities, including access to electricity and housing upgrades, and access to formal education. In addition to these measures, policies targeting the audience of family farming and traditional peoples and communities were created or expanded, resulting in significant advancements in the promotion of agroecology (Monteiro and Londres, 2017).

The advancements in the field of research and education since 2002 were also highly significant. In 2004, the Brazilian Agroecology Association was established, primarily bringing together researchers, university professors, and rural extension technicians. Since 2003, nine Brazilian agroecology congresses have been conducted, featuring academic presentations, research and extension projects involving communities and groups of professors and students, as well as lectures and conferences, providing spaces

⁷ See more about public policies regarding agroecology in Moura (2007) and Luzzi (2007)

⁸ The *Bolsa Família* Program is a federal program of direct and indirect income transfer that integrates benefits of social assistance, health, education, and employment, targeting families in poverty.

for knowledge exchange agroecology (Monteiro and Londres, 2017; Costa et al, 2015). Since then, there has been a positive evolution in the participation of indigenous peoples and other traditional communities in the agroecological movement. In 2014, fifteen indigenous ethnicities and leaders from the National Confederation of Workers in Agriculture and other movements of traditional communities actively participated in the III National Agroecology Meeting (ANA; FASE, 2014).

An important milestone in the history of the Brazilian agroecological movement was the March of the Daisies in 2011. The march was a mobilization of women's organizations from all over Brazil that has been taking place since 2000. In August 2011, 70 thousand women went to Brasília with an extensive set of agendas. One of the key points was the establishment of a program aimed at advancing the widespread adoption of agroecological practices. Following the march's conclusion, President Dilma Rousseff (2011-2016) committed to establishing a working group to formulate this program that ultimately led to the creation of the National Policy on Agroecology and Organic Production (Pnapo in Portuguese) (Torres, 2023). In this regard, the establishment of this national policy in August 2012 stands as a significant historical landmark for the Brazilian agroecological movement which is a direct outcome of the historical events discussed in this section (Monteiro and Londres, 2017).

According to Petersen *et al.* (2013), Brazil was possibly the first country in the world to have a National Policy of Agroecology and Organic Production, a Federal public policy created to expand and implement actions to guide sustainable rural development. It was developed in partnership with social movements, and one of the main drivers behind its construction was the National Agroecology Articulation. This policy represents an opportunity for organizations and social movements with an agroecological focus to channel their efforts by developing proposals.

Nevertheless, during the government of President Michel Temer (2016-2018), the Pnapo was undermined due to a lack of financial resources for the proposed initiatives. The situation deteriorated further under Jair Bolsonaro's presidency (2019-2022) as he dismantled several participation boards linked to the federal sphere – affecting the two management instruments of the policy: the National Commission on Agroecology and

Organic Production and the Interministerial Chamber of Agroecology and Organic Production. Both groups were involved in constructing the National Plans for Agroecology and Organic Production (Planapos in Portuguese) These plans establish the objectives and goals of the policy for a specific period. Without the boards and, therefore, without a plan, the policy essentially spent the last few years existing in a state of inertia (Torres, 2023). With the election of President Lula da Silva, he resumed the Pnapo and recreates the two federal bodies that had been dissolved by the Bolsonaro government which points to the strengthening of the agroecological perspective in the country (ANA, 2023)

To conclude, from 2003 to 2010, Brazil was considered one of the countries with policies and actions to be followed and even recommended as examples. According to Grisa and Schneider (2015), the Brazilian rural environment may be one of the spaces where the effects of this social construction have been most intense, leading to noticeable changes.

Moreover, Van der Berg *et al.* (2022) argue that reformist elements played a crucial role in gradually garnering support for agroecological practices and markets, while revolutionary elements served to unify the movements and enhance their potential for transformation. Over time, the strategic focus of the movement in Brazil shifted, yet the foundation of building the movement and territory remained solid. This led to the expansion of agroecology to a degree where it became impossible for either the state or other social movements to disregard it.

However, this process did not progress concerning agrarian issues and agricultural development (Árabe, 2008) and did not break with the model that maintains the hegemony of agribusiness. Sambuichu *et al.* (2017) highlight a paradox, as the same state that introduced the debate on sustainable rural development and the agroecological focus on family farming into the political agenda of some public policies adopted economic and agricultural policies that strengthened the expansion of agribusiness in the "Green Revolution" mold.

As explained by Caporal and Petersen (2012), it is in this broad political context that the positive developments toward the institutionalization of the agroecological approach in public projects and programs must be understood. This process of change has been

occurring from enclaves of sociopolitical and methodological-conceptual innovation in various government agencies that show greater coherence with sustainability promises and the commitments that the country has been making in international forums addressing environmental issues and millennium goals.

2.0 GATI's background context

In a global population growth scenario and increasing consumption of natural resources, resulting in alteration and degradation of environments and climate change, native vegetation and conserved ecosystems have become increasingly important. The biomes provide essential environmental services, such as biodiversity protection, carbon dioxide capture and storage from the atmosphere, and maintenance of local and regional hydrological and climatic cycles. In Brazil, indigenous and quilombo communities play an important role in conserving natural spaces. Protected areas correspond to more than 25% of the national territory and Indigenous Lands represent around 12,74%, they fulfill the constitutional role of guaranteeing the necessary means for the physical and cultural survival of indigenous peoples (Vianna *et al.*, 2014).

The current indigenous policy assumes that the regularization of Indigenous Lands is a fundamental part of acknowledging the rights of indigenous peoples to their land and environment. It is understood that, apart from legalizing traditionally occupied lands, it is also the responsibility of public authorities to establish policies to protect and encourage the sustainable use of Indigenous Lands. Faced with the need for the maintenance and conservation of these lands, public policies with this aim started to emerge, as in the case of the National Policy for Territorial and Environmental Management of Indigenous Lands (PNGATI, in Portuguese) (Lima, 2016).

The State's recognition of the need for territorial and environmental management policies for Indigenous Lands was only possible due to some aspects of Brazil's historical context. From the second half of the 1980s, indigenous movements across the country started to be more active with the emergence of new local and national indigenous organizations. In addition to that, the new 1988 Brazilian Constitution brought important changes to the regulation of indigenous policy in the country, such as the end of government action monopoly and advancements in the demarcation of Indigenous Lands, which were driven by both social movements and international cooperation (Garcia, 2014).

Besides that, the new Constitution shifts away from an assimilationist perspective that viewed indigenous people as a transitional social category, gradually to be incorporated into the national society, and thus destined to disappear. It also determines that the rights

of indigenous people over their lands are defined as original rights, that is, predating the establishment of the state itself (Bavaresco and Menezes, 2014).

Verdum (2005) stresses that among the positive aspects of this period of increased indigenous participation within the Federal Government in matters of their interest, there was an increase in the self-esteem and ethnic self-assertion of indigenous movements across various regions of the country. Furthermore, the author suggests that a significant shift occurred during this time, as policymaking ceased to be conducted solely "for" indigenous communities but rather began to make it directly "with" them, even though it faced numerous challenges and resistance. At that point, it became evident that indigenous organizations needed to develop new abilities and expertise to effectively manage the recognized Indigenous Lands.

Moreover, there was also a recognition that the human presence in Conservation Units (CUs) could bring direct or indirect environmental benefits to areas inhabited by indigenous peoples. Thus, the preservation of the environment became an additional reason to implement management strategies in Indigenous Lands. Additionally, there was a growing presence of international technical and financial cooperation and international organizations to support projects and initiatives related to indigenous peoples and ecosystems of global value, led by the significant international media attention to the threats to the Brazilian Amazon (Garcia, 2014).

The paramount event regarding the indigenous issue was the United Nations Conference on Environment and Development (UNCED, ECO 92, or Rio 92). It was one of the largest international gatherings held by the United Nations (UN), bringing together delegations from 172 countries. This Conference helped solidify society's perception of the interdependence between the environmental, social, cultural, and economic dimensions of development, and Indigenous people, riverine communities, and other traditional groups have become key players in the new idea of "sustainable development." (Guimarães, Fontoura, 2012; Zhouri, Laschefski, 2010)

The Rio 92 conference started a new trend, new political commitments were sealed and prominently included in both national and international agendas, with the aim of fulfilling them in the future. Regarded as a historic milestone in the international and national environmental movement, some documents signed at the Rio 92 conference

have become fundamental references in international environmental law, influencing subsequent formulations of social and environmental public policies in various countries (Santilli, Santilli, 2009).

In this context, indigenous people began to make themselves present and gain national and international visibility through their organizations and political representations, actively participating in negotiations with the Brazilian government for specific programs and projects, especially focused on addressing self-sustainability and territorial protection demands (Baniwa, 2006). The "indigenous issue," historically regarded as a "problem" to be resolved by the state, was then seen as the solution to some of the global environmental problems, due to the evidence that indigenous territories demonstrate high levels of biodiversity conservation (Printes, 2012).

The global conventions established at the Rio 92 Conference set important guidelines for environmental negotiation and financing models. The Global Environment Fund , affiliated with the World Bank, was established to function as an international financial cooperation mechanism for the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC), and it has been the sole permanent entity that provides resources for implementing the conventions signed at the UN during the conference. The GEF's leadership consists of a council involving 32 countries, representing the 166 countries that participate in the Fund. Signatory countries of the CBD and UNFCCC carry out their projects with additional funding from the GEF through implementing agencies such as the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), and the World Bank (Bensusan, 2004).

The GEF partially provides resources for projects that aim to achieve global environmental benefits and that can help, based on the project's experiences, to identify more effective public policy proposals. In this sense, the financial mechanisms necessary for the promotion of institutional connections and interactions aimed at the management of common natural resources from the local to the global level were consolidated at the Rio 92 conference (Berkes, 2005).

Furthermore, the establishment of the Ministry of the Environment in 1993 can be seen as a response to the CBD, which acknowledged that the natural resources of

biodiversity are the property of nation-states. It emphasized the importance of their preservation and sustainable use, setting a significant precedent for future environmental policies. It was an instrument developed through debates between groups of nation-states rich in socio-biodiversity and groups of nation-states possessing technologies for transforming biodiversity into industrial products to define control over natural resources (Oliveira, 2011).

In 2004 the indigenous movement obtained a seat on the National Biodiversity Commission, which is the body responsible for coordinating, monitoring, and evaluating the actions of the National Biological Diversity Program. Another milestone in recognizing the importance and contribution of indigenous people and their territories to biodiversity conservation was the 7th Conference of the Parties (COP) in Malaysia in 2004. On that occasion, Brazil committed to implementing the Work Program on Protected Areas, formalizing the recognition of Indigenous Lands as essential spaces for safeguarding biodiversity. It also recognized the need to provide financial support to indigenous peoples in practices that contribute to the sustainability of available resources in their territories (Printes, 2012).

Years later, there was an acceleration in the demarcation and regularization of Indigenous Lands through the Integrated Project for the Protection of Indigenous Peoples and Lands in Legal Amazon (PPTAL in Portuguese). Another significant achievement by indigenous peoples was the recognition of the importance of Indigenous Lands as protected areas through the National Plan for Protected Areas (PNAP in Portuguese). This plan was established taking into consideration the level of environmental conservation of indigenous territories in relation to other areas existing in the country (Oliveira, 2012).

However, the PNAP did not include goals to achieve its objectives, nor did it outline long-term strategies for the visibility and valorization of Indigenous Lands in biodiversity conservation. Due to this lack of formalized parameters by the State that define and record the benefits of biodiversity conservation in Indigenous Lands, these areas do not receive the same financial support as other Protected Areas (PAs), such as Conservation Units, in terms of combating and reducing threats to environmental integrity (UNDP; GEF, 2009).

During this same period, the Brazilian government significantly reduced its interventions, transferring responsibilities for public services aimed at indigenous peoples, such as healthcare and education, to state and municipal levels, and outsourcing the economic support for indigenous projects to NGOs system and international cooperation. In the course of this, many indigenous peoples mobilized support networks and relied on a project system, with the most notable examples being the Demonstrative Projects for Indigenous Peoples program, the Demonstrative Projects subprogram, and the Indigenous Portfolio (Oliveira, 2011).

Based on the scenario just outlined, the first initiatives of the GATI project emerged dating back to 2004 when the Ministry of the Environment created a Work Group to initiate discussions related to the development of a national project that would extend beyond the Amazon region. The project was intended to carry out actions for the protection, conservation, recovery, and sustainable use of biodiversity in Indigenous Lands, with the aim to be submitted to the GEF (Lima, 2016).

The GATI project was a joint effort involving the National Foundation of Indigenous Peoples (FUNAI in Portuguese), the Ministry of the Environment, The Nature Conservancy (TNC), the UNDP, and GEF, and it claimed to have as its background Brazilian indigenous dialogue and "indigenous leadership" (UNDP; GEF, 2009). Its main objective was to strengthen indigenous practices of natural resource management, sustainable use, and conservation, as well as to promote the social inclusion of indigenous peoples, consolidating the contribution of Indigenous Lands as essential areas for conserving biological and cultural diversity in Brazilian forest biomes (Lima, 2016).

As institutional interactions within the government became more prominent during the development of the GATI pilot project, it was evident that there were tensions arising from conflicting interests within the debate over Indigenous Lands management, involving government institutions, the Ministry of the Environment, and the National Foundation of Indigenous Peoples. In this context, Printes (2012) highlights that the ongoing tensions between indigenism and environmentalism were noticeable in the interactions among representatives of these organizations who were responsible for the project's execution.

On one hand, Ministry of the Environment representatives tended to focus on the "environmental" aspect of the debate, expressing a concern in quickly establishing clear concepts and methodologies. They suggested modifying the technical language and approaches utilized in creating Management Plans for Extractive Reserves, occasionally drawing comparisons between these Protected Areas and Indigenous Lands. On the other hand, FUNAI representatives were opposed to these arguments by emphasizing the complexity of incorporating territorial and environmental management discussions into the diverse indigenous situations within their territories. This institution operated on the premise that territorial management, as a means of protecting the land, aimed to ensure indigenous subsistence autonomy (Printes, 2012).

In addition, there was also an issue with large transnational NGOs, such as TNC; World Wildlife Fund (WWF); and Conservation International (CI) that influenced the selection of priority conservation areas, the development of management plans, and the management of Protected Areas. When providing financial support to local NGOs, they conveyed their "theoretical and practical conservationist" messages, which often diverged from the dynamics and ways of life of the populations under their influence (Diegues, 2008). Thus, in part, large transnational NGOs were responsible for setting the conservation manual, in collaboration with dominant economic forces, such as the private sector of the World Bank, which initiated negotiations with investing countries whose intentions were to "appropriate and sell biological diversity" (Printes, 2012).

Critiques regarding the connection of the GATI project with the interests of the GEF and TNC are aspects that contributed to certain considerations regarding the future directions that management in Indigenous Lands could potentially take in the long term. Printes (2012) highlights that the language used in the project document includes terms such as "measure," "test," "capacity-building," "awareness," "training," "allocate areas for conservation," "replicable management models," "indigenous peoples as guardians of the forest," among others, which strongly reflect the persistence of environmentalist preservationist logics.

Therefore, according to the same author, the GATI project can be understood from a perspective closely linked to hegemonic paradigms of biodiversity conservation, aiming to formalize regulations that legitimize Indigenous Lands as Protected Areas. However, as the author notes, it is important to consider the efforts of the involved actors such as

National Foundation of Indigenous Peoples managers, Chico Mendes Institute for Biodiversity Conservation managers, indigenous organization representatives, UNDP and GIZ technicians, and the GATI project implementation team who, aware of this tendency, sought to implement it in a less biased manner. They recognized the project's limitations or the preservationist/conservationist approach it has been associated with since its inception and for funding purposes.

Despite these critiques, GATI can be considered innovative due to how indigenous participation occurred. In addition to the fundamental role played by the indigenous movement in advocating for the project with the government, directing its development, and facilitating its presentation to financiers. The process of formulation and development of the project will be further developed in the following section.

2.1 Formulation stage: goals, regional consultation, and indigenous participation

Promoting indigenous leadership from its development phase, GATI had two central objectives: to contribute to the recognition of Indigenous Lands as essential protected areas for the conservation of Brazilian biodiversity and to strengthen indigenous traditional practices for the management, sustainable use, and conservation of natural resources. From the beginning, the project struggled with the challenge of reconciling the conceptual frameworks from the field of biodiversity conservation with the indigenous perspectives. By associating environmentalism and indigenism, it addressed institutional barriers and local conflicts surrounding this duality. Thus, it was necessary to articulate a broader movement: the pursuit of common understandings between articulators of indigenous rights and environmentalists, transcending more preservationist views and truly acknowledging the role of Indigenous Lands in biodiversity conservation strategies. Despite that, GATI was the first project to exclusively focus on Indigenous Lands and indigenous people as leading actors (Vianna *et al.*, 2014).

The proposed duration for GATI was five years (2009 to 2014), starting in 2009 following the approval of the project proposal by GEF and an expected completion in 2014. However, in 2014, the project was extended for an additional two years, considering the need to continue some ongoing actions that still required monitoring or

financial support (Lima, 2016). The initial idea was to conduct regional consultations to select Indigenous Lands considered important for the project's proposal, which exhibited good practices within each forest biome. The proposal was to take a pool of 30 Indigenous Lands and work with 10 of them as Reference Areas (RAs) while the other 20 areas of remaining interest, receiving fewer votes in regional consultations, would be chosen to constitute the Experience Network (EN). The intention was to select the Indigenous Lands capable of playing a strategic role in demonstrating ethnocultural initiatives for biodiversity conservation, serving as a starting point for future initiatives in other Indigenous Lands. (UNDP; GEF, 2009).

Nevertheless, there was a significant point to consider regarding the categories of Indigenous Lands that would be part of the project. When the project was developed and regional consultations were conducted, there were two categories above mentioned: RA and EN. Nonetheless, as the regional consultations progressed, this was questioned, as there was a concern that the project was establishing first and second-class Indigenous Lands in the project. It became apparent that, in practice, Indigenous Lands within the EN category had more environmental management activities than the RAs themselves. Therefore, it was decided to equalize these categories without distinction in terms of project support. It was then decided to consider all Indigenous Lands as RAs (GATI's Technical Coordinator, 2011, as cited in Printes, 2012). Additionally, two other Indigenous Lands that were not part of the initial list were included, bringing the total number of RAs to 32 (Lima, 2016).

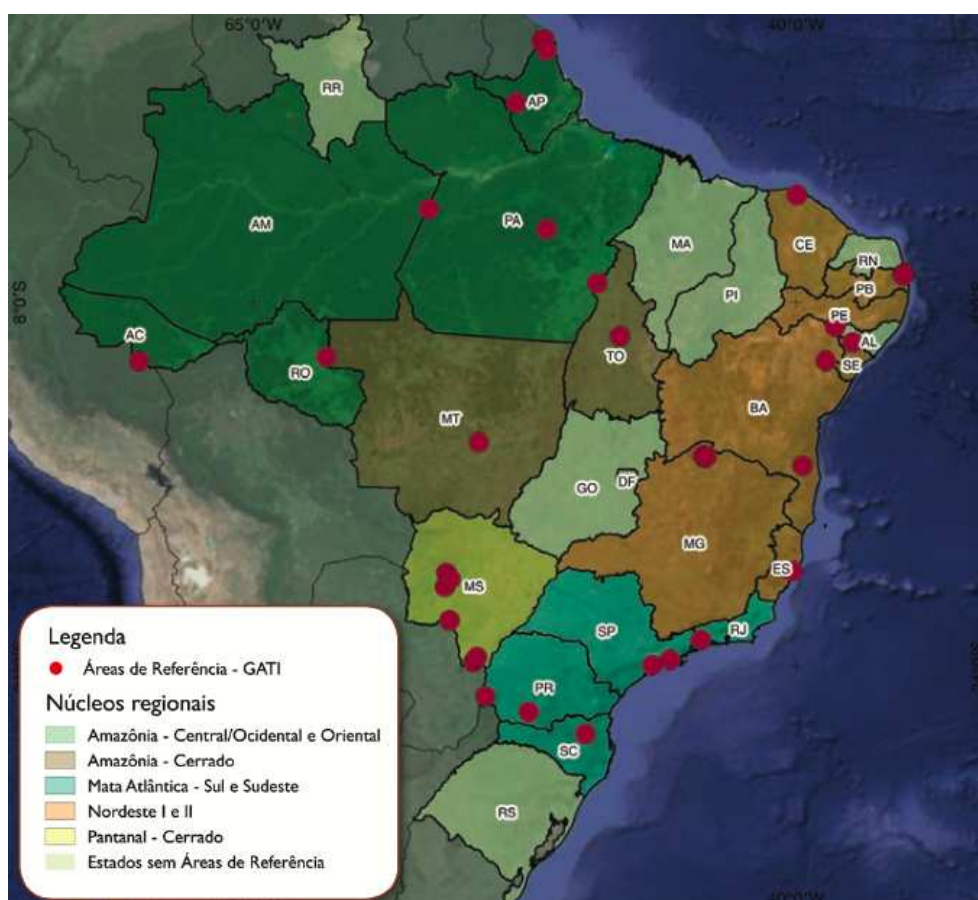
The selection of Indigenous Lands to become RAs was made by indigenous representatives who participated in regional consultations during the project's development period. The criteria employed to select the RAs were technical, but also politically motivated, aiming to achieve a higher level of representation for the main indigenous organizations participating and to establish a balanced distribution of influence in each operational area (Bavaresco *et al.*, 2016). However, the process of nominating the RAs was carried out by the Brazilian Biodiversity Conservation and Sustainable Use Project (PROBIO in Portuguese), based on the following premises:

"a) at least one RA in each forest biome; b) the definition of RAs had to align with the priority areas defined by the List of Priority Areas for Biodiversity Conservation by PROBIO/Ministry of Environment, published in 1997; c) among these priority areas defined by PROBIO, indigenous communities

selected a shortlist of RAs through the regional consultations" (UNDP; GEF, 2009, p.4).

Thus, the idea was that the Indigenous Lands would be chosen based on the activities related to resource management, conservation, and sustainable use of natural resources that were already being carried out, but even so, some RAs still presented an extremely complex situation, resulting from decades of land conflicts, the impacts of large enterprises, agribusiness, monocultures, and misguided government actions. The project's intention was to enhance these existing activities by creating networks of experiences and strengthening initiatives (Bavaresco *et al.*, 2016; Vianna *et al.*, 2014). After the merging process of RAs and ENs, 32 Indigenous Lands were designated as RAs for the GATI pilot project and were divided into 8 Regional Centers, encompassing five biomes: Amazon, Caatinga, Cerrado, Pantanal, and Atlantic Forest (subregions: Northeast, South, and Southeast) (Lima, 2016).

Map 1. Distribution of References Areas



Source: (Bavaresco *et al.*, 2016)

Based on the identification of the local specificities of each reference area, GATI's actions were structured to generate results at both regional and national levels, within a comprehensive framework with three outcomes:

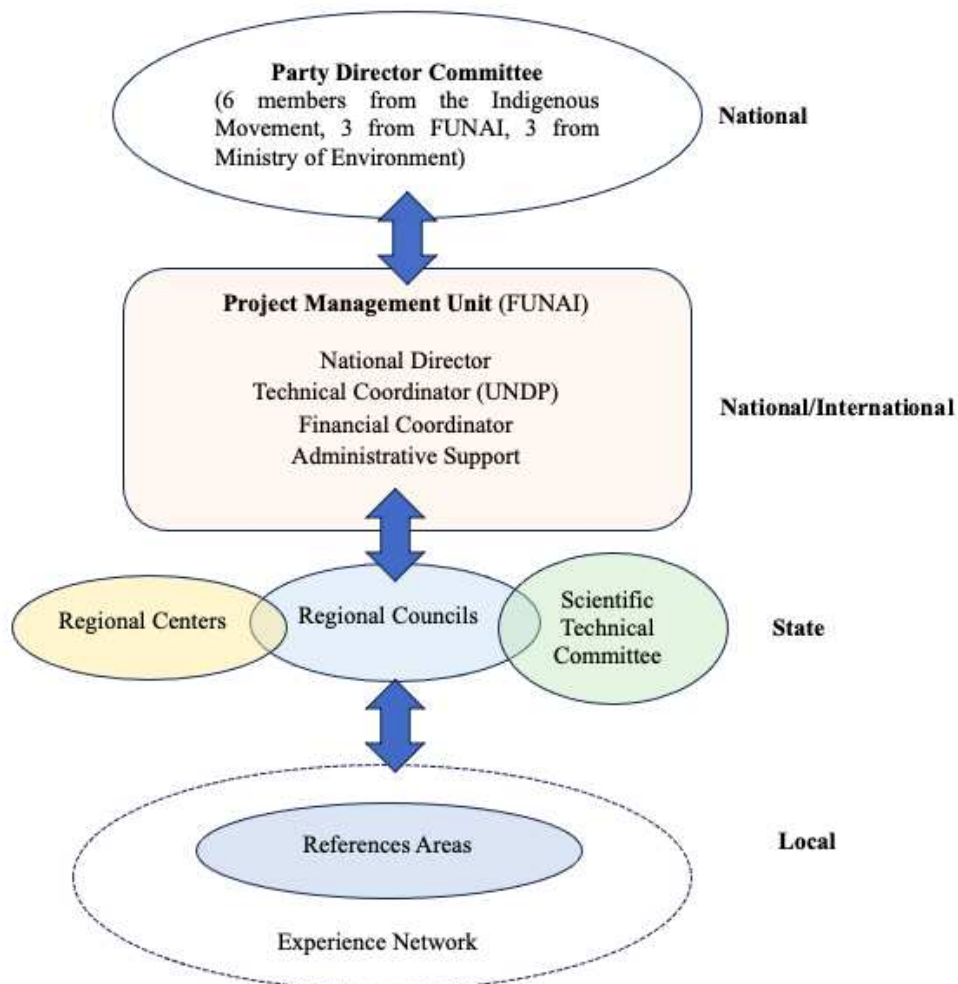
- 1) Strengthening and structuring mechanisms and tools that allow for recognizing and enhancing the contribution of Indigenous Lands to the conservation of natural resources, forest biodiversity, and their environmental services.
- 2) Consolidation of a network of management experiences in Indigenous Lands through support for the development and implementation of Territorial and Environmental Management Plans (PGTAs in Portuguese).
- 3) Support for initiatives aimed at restoring degraded areas, agroforestry systems, agroecological production, and good practices in extraction activities in the Reference Areas (Vianna *et al*, 2014, p.7)

Regarding the institutional organization of the project, when the discussions between the indigenous movements and the Federal Government started back in 2004, it was not clear who would manage the resources and carry out the project activities. Initially, there was an expectation that the indigenous movement would take on the role of managing these resources. Consequently, it was natural for indigenous organizations to envision the possibility of becoming managers and implementers of the project. However, as discussions unfolded and bureaucratic obstacles from the funders arose, it was decided that FUNAI would manage the resources instead of the indigenous organizations. This decision led to frustration among some of the mobilized organizations, as they would not achieve full autonomy in addressing their demands as they had hoped. When the project finally began to take shape, this initial frustration was gradually overcome by the creation of a Steering Committee, which became the decision-making body for indigenous peoples, with equal participation from indigenous representatives and government bodies. It went beyond the typical consultative role and played a crucial role in project governance (APIB, 2016).

In this way, the highest authority of the project was the Project Steering Committee, responsible for: a) discussing and approving the Annual Operational Plan; b) allocating the resources; c) evaluating the ongoing and finished activities according to the GEF-UNDP guidelines. The committee was deliberative and composed of a parity council, consisting of 6 members from indigenous organizations (ARPINSUL,

ARPIPAN, APOINME, and COIAB in Portuguese⁹); 3 from the Ministry of the Environment; and 3 from FUNAI, with UNDP and TNC serving as observers (Lima, 2016) (Fig. X).

Fig. 2. Charter of the Institutional Arrangement of the GATI Project



Source: Translated from UNDP, 2011, p.5

The project implementation was based on a Project Management Unit (PMU) integrated into the structure of FUNAI which was responsible for promoting internal coordination with other General Coordinations within the agency in Brasília and with its Regional Coordinations (RCs). The involvement of FUNAI employees in the project's activities brought the learning of new methodologies, concepts, and practices. The employees not

⁹ Coordination of Indigenous Peoples of the South, Coordination of Indigenous Peoples of the Pantanal and Region, Coordination of Indigenous Peoples of the Northeast, Minas Gerais, and Espírito Santo, Coordination of Indigenous Organizations of the Brazilian Amazon, respectively.

only assisted in the logistical execution of activities but also took part in various courses, exchanges, and training processes (Vianna *et al.*, 2014). Furthermore, the PMU had a direct relationship with the Regional Centers, which were responsible for supporting on-site activities in the RAs. The Regional Centers were connected to the Deliberative Regional Councils (DRCs), tasked with assessing the regional situation and composed of indigenous representatives from the RAs and government members (FUNAI and Ministry of the Environment).

The Regional Centers were also supported by Technical Scientific Committees composed of academics, specialists, scientists, and other partnerships from academic institutions, as well as local NGOs. They were responsible for assisting the Project Steering Committee by conducting evaluations of the project's performance, providing systematic information, and offering a critical assessment of its results (UNDP, 2011).

In addition to this technical committee, the Regional Centers were also composed of a Regional Consultant hired to support the project's implementation in RAs, in collaboration with indigenous communities, and to be directly involved with government agencies. The consultant's role was to closely monitor the project, assisting and supporting indigenous communities in the preparation, planning, and development of local projects, implementation, monitoring/evaluation, and writing progress reports. The characteristic of this inter institutional arrangement highlights the tendency of the GATI Project to operate through the interaction between institutional scales at different levels of management, simultaneously (Lima, 2016; Printes, 2012).

Throughout the project implementation, four instruments were the most used: Microproject, Letters of agreement, Small Contracts, and raising new funding sources. The GATI Microprojects aimed to finance small initiatives to be implemented in villages and regions. The Microprojects provided support of up to 4,000 Brazilian Reais, directly deposited into the bank accounts of local leaders or representatives, with the purpose of financing initiatives within the communities or indigenous organizations. These projects allowed for greater political mobilization of local indigenous leaders without the need for the existence of a prior formal institutional structure, such as associations or cooperatives (APIB, 2016).

The range of supported activities was very diverse, encompassing everything from the cultivation of plant seedlings, raising small animals, and income-generating activities, to the organization of courses and meetings. According to Siqueira Jr. (2016), the outcomes of these activities were highly positive, given that the beneficiary community also exercised strong social oversight over the individual responsible for implementing the Microproject

The Letters of Agreement are an instrument already employed by UNDP that enables the direct transfer of project funds to legal entities, civil society organizations with experience in a specific indigenous people/region, management capability, and beneficiary assessment/consent. This instrument facilitated the simultaneous implementation of actions in various regions, also aiding in integrating the project into activities already being conducted by partners. The third instrument was small contracts for individuals, with a value of up to 2,500 Brazilian Reais. This instrument proved to be highly valuable in facilitating various services quickly and efficiently, resulting in important outcomes such as technical support for drafting project tender documents, layout design for publications, specific training, technical support for indigenous people in preparing projects with other sources of funding. The fourth one was related to the mobilization of new funding sources to support the actions, particularly with the Ministry of Environment, to access the Climate Fund, and with the National Bank for Economic and Social Development (BNDES in Portuguese), to access the Amazon Fund (Siqueira Jr., 2016).

2.2 PNGATI

Since ancient times, indigenous peoples have managed their territories and natural resources through different strategies and their own systems of knowledge. This ensured high-quality food, the preservation of their culture and rituals, the production of crafts and artifacts, and diverse exchanges with other groups, in a constant process of resource management. This collection of actions, techniques, and knowledge is what Western science refers to as the management of natural resources, which is crucial for sustaining life. This management can also be referred to as governance, meaning taking care of things so that all can benefit from them. Indigenous peoples have always managed their resources and practiced governance, meaning they have taken care of their territories through knowledge guided by their cultural traditions (Bavaresco, Menezes, 2014)

However, over time, it became necessary to develop public policies to promote the management of the environments and territories of Brazilian indigenous lands. Bavaresco and Menezes (2014) highlight that this necessity emerged due to the various challenges faced by Indigenous Lands, such as the encroachment of agricultural and livestock activities from surrounding rural properties, infrastructure projects (roads, dams, ports), and the expansion of urban areas, are some external pressures. At the same time, within indigenous lands, the population and number of villages are increasing, and the previously abundant resources are decreasing and may not be sufficient to ensure the quality of life in these communities. Changes in the indigenous way of life require new ways and strategies to think about the future and sustainability of these territories. If the primary challenge for indigenous peoples used to be the acquisition of land and basic rights such as health and education, nowadays there is another significant challenge: ensuring the management and sustainability of these territories by combining the knowledge of indigenous peoples with the science of non-indigenous people.

Therefore, during the discussions of the GATI Project, it was evident that the demands for the implementation of indigenous territorial management projects were so extensive that they exceeded the limits originally established by the project - that is, to only include 32 Indigenous Lands or RAs. Shortly after the creation of the GATI Project, there were favorable political conditions and a push from the indigenous movement to address territorial and environmental management policies at the national level. Hence, the PNGATI was born aiming to seek new mechanisms and concepts to ensure that indigenous peoples can live well in their territories, with a balanced environment, and have the possibility to use their resources with autonomy and sustainability (APIB, 2016; Bavaresco and Menezes, 2014).

The objective of PNGATI is to ensure and promote the protection, recovery, conservation, and sustainable use of natural resources in indigenous lands and territories. There are 7 axes that structure the specific objectives of the policy:

I. territorial protection and protection of natural resources; II. indigenous governance and participation; III. protected areas, conservation units, and indigenous lands; IV. prevention and recovery of environmental damage; V. sustainable use of natural resources and indigenous productive initiatives; VI. intellectual property and genetic heritage; and VII. training, formation, exchange, and environmental education. (FUNAI, 2013, p.3)

The works regarding the PNGATI started in September 2008, when an Inter Ministerial Working Group was established to specifically tackle these public policies at the Federal level. From this group, an intense work was developed on the viability and implementation of regional consultations throughout Brazil, in which the instruments, areas of action, governance, and organization of PNGATI were discussed with local leaders. The process of developing the document draft was based on the guidelines established in Convention 169 of the International Labor Organization, regarding the rights of indigenous peoples to be consulted on legislative measures that may directly affect them (APIB, 2016; FUNAI, 2013).

The underlying idea was that the rights holders should receive early notification regarding the details of a particular project or public policy. By having access to comprehensive and precise information beforehand about the proposed initiative that will impact them in some manner, indigenous communities can, through their representative organizations and voluntary involvement, evaluate the potential social, political, economic, and cultural consequences for their societies. Thus, they can make a decision regarding whether to engage in and endorse these activities or not (Oliveira, 2011).

In addition to the issue of respecting indigenous rights, PNGATI also incorporated the accumulation of discussions and experiences consolidated in the scope of policies, programs, actions, projects, and events in the field of Territorial and Environmental Management of Indigenous Lands, jointly developed by indigenous peoples and organizations, government and non-governmental institutions throughout the country. Five regional consultations were held from November 2009 to April 2010 in all Brazilian macro-regions: North, Northeast, Midwest, Southeast, and South. Approximately 1,200 indigenous leaders, representing 186 indigenous peoples, participated in these consultations. During this opportunity, the leaders had access to a guiding Base Document formulated by the Interministerial Working Group. This document aimed to bring forth the specific subjects for discussion while also enabling the integration of alterations and viewpoints from indigenous communities across various regions of the nation (APIB, 2016).

The purpose of the consultations was to present, discuss, and gather proposals and suggestions from indigenous peoples regarding what should be done to ensure the

protection, recovery, conservation, and sustainable use of natural resources in indigenous territories, with the aim of improving the preliminary draft of the PNGATI formulated by the Interministerial Working Group. The final text, incorporating the results of the consultations, would have to be approved by the National Commission for Indigenous Policy (CNPI in Portuguese) and then presented to the President of the Republic in the form of a decree-law for his signature (Oliveira, 2011).

The consultations were held in a four-day format, including the arrival and departure days. The first day was allocated for preparation, during which the event was organized in an assembly format, featuring presentations and discussions about the process, with the support of informational materials and the use of audiovisual resources. The second and third days were designated as the working days of the consultation, with plenary presentations on the foundations of the PNGATI and the construction of the policy text, conducted by pairs of government and indigenous representatives who were members of the Interministerial Working Group (Oliveira, 2011).

Following that, collaborative efforts on the Base Document occurred, and the outcomes of these group activities were shared during a plenary session, with the ultimate goal of solidifying the consultation within the plenary. During the initial negotiations concerning the consultations, the indigenous representatives within the Interministerial Working Group suggested arranging ten events. However, government members considered that this proposal would be less feasible, considering factors such as costs, logistics, and time constraints (Oliveira, 2011).

Table 1: Regional Consultations

	When	Where	No of participants
1° Regional Consultation	From 23 to 26/11/2009	Recife (PE)	240 indigenous people, representatives of 47 peoples from the Northeast region
2° Regional Consultation	From 14 to 17/12/2009	Curitiba (PR)	140 indigenous people, from 12 different peoples from the South region and the states of São Paulo and Rio de Janeiro
3° Regional Consultation	From 26 to 29/1/2010	Campo Grande (MS)	190 indigenous people, from 7 different peoples

4° Regional Consultation	From 27 to 30/5/2010	Cuiabá (MT)	320 indigenous people, representatives of 56 different peoples from the Central-West region, Tocantins, Maranhão and Pará
5° Regional Consultation	From 25 to 28/6/2010	Manaus (AM)	350 indigenous people, from 64 peoples from the North region

Source: Oliveira, 2011, p.29

Nevertheless, there were some complaints raised by the primary stakeholders and beneficiaries of the PNGATI during the consultation process. Firstly, the Base Document utilized excessively technical language, distancing itself from its target audience, which should have been the indigenous representatives present at the consultations. The outcome observed during the events was that, in many cases, indigenous representatives familiar with Portuguese and state bureaucracy had difficulty understanding what was actually being proposed. Secondly, for many indigenous participants, the document also did not make clear the relationship between the two federal government agencies – FUNAI and Ministry of the Environment - so the concern about the "address" of the policy within the State emerged in various dialogue contexts throughout the process (Oliveira, 2011).

Furthermore, regarding the power dynamics introduced by the formation of the Interministerial Working Group, it became evident that a significant number of participants failed to fully comprehend the extent of indigenous involvement within this group. As a result, they perceived the Base Document merely as another governmental proposition. Finally, a third aspect concerns the fact that the document includes information about the GATI Project without clear and precise explanations of what the project is. Despite its direct and structural connection with PNGATI, this lack of clarity ended up confusing many participants in the process regarding the scope of each proposal and its interrelation (Oliveira, 2011).

Despite these issues, according to Oliveira (2011), the concept of participation is now a central element in most programs and projects supported by the state and international development agencies. Indigenous participation in the formulation of public policies for their own people should be self-evident but is the result of a long history of struggle by indigenous movements. Historically, indigenous peoples were the "subjects" of state

intervention actions, in a relationship regime marked by tutelage. The 1988 Federal Constitution is a milestone for indigenous peoples, particularly due to the legal change it brought about in the relations between the state and indigenous peoples. The 1988 Constitution marked the beginning of a less unequal game in this relationship, leading to the recognition of ethnic agency by the state and the participatory processes that are currently witnessed. In the case of the construction of PNGATI, indigenous participation was the driving force behind the entire endeavor, from the formation of the Interministerial Working Group to the final consultation. In practice, indigenous leaders from across the country were convened to take part in the process through a series of events, aimed at aligning the PNGATI proposal with their needs and interests. Indigenous participation is an achievement of indigenous movements, while also being associated with broader processes of debate within the state that facilitate such participation.

Moving to its administrative organization within the Federal Government, the PNGATI guided the development of the Pluriannual Government Plan 2012-2015, becoming a strategic objective of the Federal Government's Program for the Protection and Promotion of the Rights of Indigenous Peoples, coordinated by FUNAI. Several of the goals of this strategic objective were jointly developed by FUNAI and the Ministry of the Environment, such as implementing 51 environmental and territorial management plans for indigenous lands and providing continuous training courses for indigenous and non-indigenous managers to enhance environmental and territorial management actions on indigenous lands. To coordinate the set of actions for policy implementation, the PNGATI Management Committee was established, consisting of various ministries and representatives of indigenous peoples. FUNAI's role in this Management Committee was to serve as its Executive Secretariat, responsible for facilitating the successful execution of PNGATI and implementing a significant portion of the actions. This required creating and developing new capabilities, building upon the existing indigenous knowledge within the institution (FUNAI, 2013).

The Ministry of the Environment shared responsibility for implementing the policy at the national level and was also a partner of FUNAI in implementing the GATI Project. To achieve this, it was essential to devise mechanisms and instruments to support the environmental and territorial management of indigenous lands, working in collaboration with other agencies and indigenous organizations, sharing information, tools,

methodologies, and procedures to develop context-specific and effective reference methodologies. This created the need for specialized technical support for proposals related to the environmental and territorial management of indigenous lands, strengthening, enhancing, valuing, and expanding existing capacities, both of indigenous peoples and their organizations, as well as FUNAI (FUNAI, 2013).

There was an expectation that the PNGATI would be decreed during President Lula's government, still in 2010, but the decree was only signed two years after the end of his term, in the second year of President Dilma Rousseff Government, in 2012. This process resulted in some losses originally proposed in the discussion on the decree. There were some changes, which showed the limits of participation and deliberation in spaces of this kind to the indigenous movement. Nevertheless, the PNGATI is an achievement of indigenous peoples, and its strengthening is necessary to guarantee our rights (APIB, 2016).

Finally, approximately three years after the signing of the decree that established PNGATI, there was a need to join efforts for the implementation of this new policy. In this regard, the PNGATI Management Committee engaged in various discussions that culminated in the development of the Integrated Implementation Plan of PNGATI (PII-PNGATI in Portuguese). The PII-PNGATI can be understood as a set of guidelines and management and funding mechanisms for the policy. This plan was conceived within the framework of the Policy's Management Committee as the primary instrument for coordinating government agencies, indigenous peoples, their organizations, and partner entities in joint planning, execution, monitoring, and evaluation of environmental and territorial management actions for indigenous lands for the period of 2016-2019. Thus, it serves as a strategic tool for coordinating the execution of PNGATI and achieving its objectives. It also incorporates, as equally fundamental principles, the promotion of intersectorality, transparency, social control, and the participation of indigenous peoples in decision-making processes, as well as in the management and execution of the Brazilian government's indigenous policy (Smith, Stibich and Grupioni 2016).

2.4 Territorial and Environmental Management and its instruments

As briefly mentioned in the previous section, indigenous peoples use, transform, and reinterpret their spaces according to their choices, traditions, norms, rituals, and cultures, thereby establishing forms of natural resource utilization and control over traditional territories. Within this context, it becomes apparent that the notion of Territorial and Environmental Management of Indigenous Lands combines the political dimension of territorial control with the environmental dimension of actions aimed at their sustainability, involving activities related to territorial planning and environmental management (Little, 2006).

In this sense, it is important to understand the underlying principles of Territorial and Environmental Management and the key instruments associated with it. As explained by Little (2006), in his work titled "*Territorial Management in Indigenous Lands: Definition of Concepts and Proposed Guidelines*", in analytical terms, it can be identified two distinct conceptual realms within the field of territorial management: (1) the realm of human actions, which deals with the concepts of "planning" and "management," and (2) the material realm where the concepts of "territorial" and "environmental" are significant.

Regarding the difference between "planning" and "management," both terms when applied to the biophysical environment, are used interchangeably to refer to processes related to the utilization of natural resources. However, there are significant differences in the meanings of these two terms that are worth being clarified. The term "planning" refers to human actions that arrange the environment according to the desires or plans of a group or institution. Thus, it is the "expression of the will" of a particular group or institution. It involves a kind of "organization" of the biophysical space. This organization can encompass the "methodical distribution" or the "spatial organization" of the environment. In essence, the core of the concept of "planning" lies in the projects, plans, or will of different human groups or institutions (Little, 2006, p.18,19).

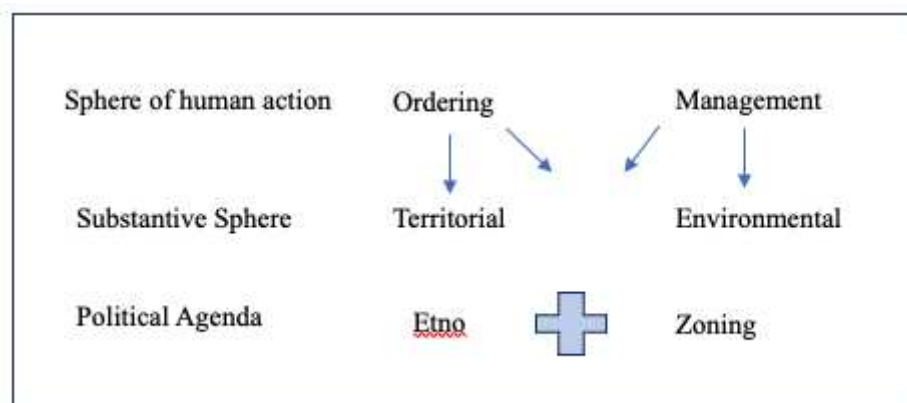
On the other hand, the term "management" also implies human actions, but these actions are more focused on "administering," "managing," or "directing" something that is already established. Although these words are more commonly used in the business or governmental context, they can also apply to situations involving the administration

of ecosystems or the use of natural resources. In this application, there is a greater emphasis on the maintenance or conservation of the ecosystems under management compared to the term "planning" (Little, 2006, p.19). Moving to the concepts of "territorial" and "environmental", the term "territory" indicates the "extent or geographic base of a State" (or another political entity) over which it exercises sovereignty or control. Thus, "territory" is primarily a political concept. In this sense, "territory" is distinct from "land," understood as an "unspecified area or region". In other words, the term "territory" is always associated with a specific political entity (Little, 2006, p.19).

In contrast, the term "environmental" is broader than that of "territory." In general terms, the environment refers to "everything that surrounds or encloses living beings." While it is true that the environment is defined in relation to an organism or a community of organisms, the relationship between organisms and their environment is ecological in nature and not directly political, as is the case with the concept of "territory." Another distinction to be made is between biophysical or natural environments (which do not involve humans) and built or artificial environments (which are the product of human action). In most cases, these two types of environments are closely interconnected, but one type may predominate over the other: in a sparsely populated tropical forest, the biophysical environment would predominate, while in a large city, the built environment would predominate (Little, 2006, p.19).

Based on these concepts, Little (2006) combines the terms from the sphere of human action (planning and management) with those from the substantive sphere (territorial and environmental) and those from political agendas (ethnicity and zoning) as exemplified in the table below.

Fig. 3. Basic Concepts of the Field of Territorial Management



Source: Translated from Little, 2006, p.20

This exercise generates the five key concepts for the field of Indigenous Land Territorial Management: (i) territorial planning; (ii) environmental planning; (iii) environmental management; (iv) territorial management; and (v) Ethno-zoning. Since these concepts are commonly used in the context of both the GATI project and the PNGATI, it is relevant to examine their definitions closely.

Firstly, according to Little, Territorial Planning is a set of public policies developed and implemented by a political entity which could be a nation-state, a federal entity, a municipality, or an Indigenous Land, among others. Its purpose is to structure, coordinate, and govern the utilization of the geographic region that forms its territorial boundaries. Within this framework, territorial planning includes the methods employed by this entity to articulate its objectives concerning the economic, political, social, and environmental utilization of this territory. The concept is based on the efforts of the political entity to exercise effective control over its territory and to regulate its use for public purposes.

Secondly, according to Little, Environmental Planning can be characterized as actions, whether public or private, aimed at the restructuring and/or transformation of the biophysical environment to serve human purposes. Although this concept is not very common in the literature, it represents one of the most common policies for the use of a geographical area or region. "Landscaping" is a clear example of environmental planning, as it involves "the art and technique of planning and organizing the landscape to enable humans to make greater use and enjoyment of large outdoor spaces for

collective use." Another instance of environmental planning can be seen in the construction of a dam on a river, where the dam's function is to "structure" or "manage" the river's flow in alignment with human interests. Environmental planning constitutes a fundamental element in numerous practices related to economic development (Little, 2006, p.20).

Thirdly, Environmental Management encompasses activities related to the control and administration of biophysical processes within ecosystems, with the aim of conserving and sustainably utilizing nature. The concept is less concerned with transforming the environment and more focused on its maintenance as an ecological system. When environmental management is employed for productive purposes, it relies on techniques with low impact on biophysical flows. Consequently, this approach necessitates a comprehensive understanding of the functionality of the ecosystems or biomes under management. Examples of environmental management techniques include the development of management plans for protected areas and strategies for the utilization of sustainable conservation units (Little, 2006).

Fourthly, Territorial Management can be defined as the political control and environmental management of the geographic space that constitutes the territory of a social group or political entity. Given that it relates to the territory of a specific social group rather than an ecosystem, the concept of territorial management operates primarily within the realm of politics. Consequently, the actions involved in governing or administering this territory, as encompassed by the concept of management, are conducted by this social group. However, these actions, besides serving their social, economic, and political interests, also include a concern for the proper management of the biophysical flows within the territory. Therefore, the concept of Territorial Management of Indigenous Lands is the one that best combines the political dimension of territorial control of Indigenous Lands with the environmental dimension of actions aimed at their sustainability. Consequently, this concept encompasses activities related to both territorial planning and environmental management as essential components of its implementation (Little, 2006).

The last concept presented by Little (2006) is ethno-zoning, which can be associated with ethno-mapping, both of which are tools utilized to direct the Territorial and Environmental Management of Indigenous Lands. Ethno-zoning is a technical and

political instrument for the territorial organization of an ethnic group that is part of the normative phase of the overall territorial management process. The author emphasizes that, as Territorial Management of Indigenous Lands has become the overarching concept, the concept of ethno-zoning is narrowed in scope to become a specific instrument for territorial organization used by indigenous peoples for territorial management. It is worth noting that ethno-zoning is not an original demand of indigenous peoples. Environmental zoning is a Western, highly technical instrument that is being introduced to indigenous peoples with the aim of assisting them in their territorial management process. The analysis of various experiences reveals that almost all of them have the goal of inducing indigenous people to accept and incorporate the use of the technical instrument as part of their daily ethnic project (Little, 2006).

Ethno-mapping is the participatory mapping of areas of environmental, sociocultural, and productive relevance for indigenous peoples, based on indigenous knowledge and wisdom. In practice, it involves mapping, collecting data, identifying, and recognizing all of this from the "indigenous world." On the other hand, ethno-zoning is described as a participatory planning tool aimed at categorizing areas of environmental, sociocultural, and productive relevance for indigenous peoples, developed based on ethno-mapping. It involves the act of "zoning" and "defining zones and areas (Lima, 2016).

In addition, Management instruments also serve other purposes, including but not limited to: enhancing understanding of the territory, fostering the exchange of knowledge between indigenous communities and society, promoting knowledge sharing within indigenous communities, particularly between the older and younger generations, raising awareness about rights and responsibilities, especially those related to claim, defense and protection of territories and environmental resources, and acting as a means for disseminating information related to environmental preservation and the sustainable utilization of environmental resources within Indigenous Lands (Maciel, 2016).

The significance of management instruments at the federal government level became more pronounced during the discussions and consultations leading to the development of the PNGATI, which took place in various regions of the country between 2009 and 2011. With the promulgation of the decree establishing PNGATI, Ethno-Mapping and Ethno-Zoning were conceptually defined and officially incorporated as part of

indigenous and environmental public policy at the national level, establishing them as important frameworks for their implementation at the local level (Maciel, 2016).

Furthermore, the GATI Project carried out work related to Management Instruments in all of its Regional Centers, encountering a diversity of interethnic, socio-historical, and distinct environmental situations in their Reference Areas. In general and simplified terms, it considered Indigenous Lands and Peoples with little, recent, or, in some cases, no prior experience with Management Instruments, primarily located in the South and Southeast Atlantic Forest, Northeast Regions 1 and 2, and Pantanal-Cerrado Regional Centers. Additionally, it included Indigenous Lands and Peoples who were already involved with such instruments, particularly those located in practically all areas of the Central/Western Amazon and Eastern Amazon Regional Centers (Maciel, 2016).

3.0 History of Terena People

The Terena people's history is extensive and intertwined with the narratives of various indigenous communities, Europeans, Africans, and their descendants. The Terena are descendants of the *Aruak* cultural and linguistic tradition (the linguistic branch from which the Guaná-Txané language derives). The Guaná-Txané people distinguish themselves through subgroups, which include Terena, Echoaladi, Quinquinau, and Laiana. In a summary of what the chroniclers of the 16th century wrote, the main social attributes of the Guaná-Txané, or simply Guaná, who inhabited the Paraguay Basin, are found in their cultivation of fields, their work with ceramics, and the establishment of large villages where ethnically diverse individuals came together (Fehlauer, 2004).

Based on oral tradition, Bittencourt and Ladeira (2000) describe crucial historical moments of the Terena people in their book "The History of the Terena People." Within its pages, they delineate three main periods in Terena's history: i) Ancient times: marked by two important events the Êxiva and the Paraguayan War; ii) Times of servitude, including the reserve situation; and iii) Current times. In addition, a fourth period – Awakening time - is proposed by Miranda (2006). According to the authors, recalling these moments and seeking to understand them is important in order to perceive current events and how they are connected to the past.

3.0.1 Ancient Times: Êxiva and The Paraguayan War¹⁰

The Terena people used to live in the Êxiva region, known to non-indigenous people as *Chaco*¹¹. The white settlers arrived in this area by navigating the Paraguay River, coming from the port of Buenos Aires. They were attracted by legends of the wealth of gold and silver mines in the Andes region, with the richest silver mine being Potosi, in the territory that is Bolivia. As a result, they began organizing expeditions to the mining region, but the shortest route led through the Chaco region. Thus, in the 16th century the history of contact between the indigenous peoples, the original inhabitants, and the Europeans began (Bittencourt and Ladeira, 2000).

¹⁰ The Paraguayan War (1864-70) was a conflict between Brazil, Argentina and Uruguay (The Triple Alliance) against Paraguay for the dominion of the Río de la Plata. It was the longest and the bloodiest inter-state war in the history of Latin America and It had a profound effect on the economies, politics and societies of all four countries engaged (See more in Bethell, 2018).

¹¹ Chaco (from the Quechua *chaqu*: hunting ground) is a region of approximately 1,280,000 km² and comprises parts of Paraguayan, Bolivian, Argentine and Brazilian territory (north of the Pantanal).

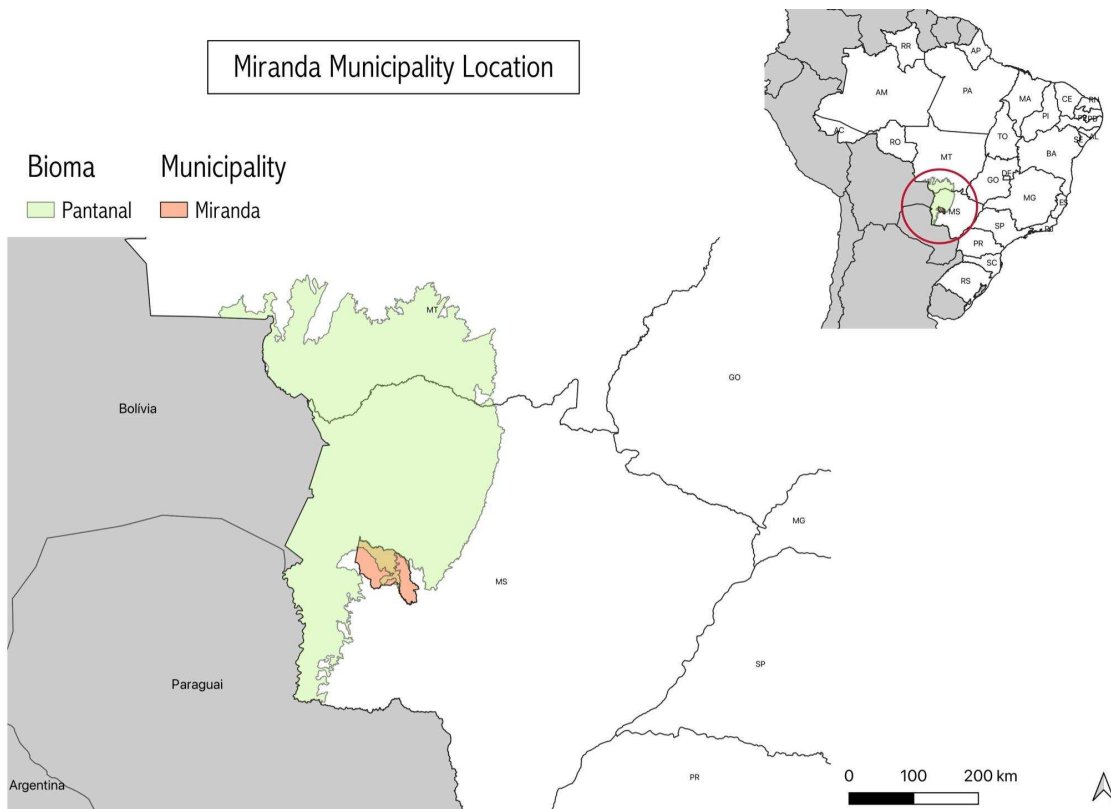
Map 2. Location of Chaco in South America including the State Mato Grosso do Sul



Source: Lima *et al.*, 2017

There were many conflicts because the white settlers sought to conquer the lands near the Plata river, driven by their interest in gold and silver. Disputes arose among the Europeans, with Portuguese and Spanish forces fighting for control over mineral-rich regions. Additionally, there were wars against the indigenous populations who resisted the conquest of their territories. These conflicts entangled various tribes in the region, and many villages were destroyed during these wars (Bittencourt and Ladeira, 2000). From the second half of the 18th century, between the years 1760 and 1767, the Terena people migrated to the region that is now Mato Grosso do Sul (MS), occupying an extensive territory in the South Pantanal, more specifically in the Miranda region (Map 3). They turned to agriculture and forged crucial alliances with the Guaikuru and Portuguese to ensure their survival (Oliveira, 1976).

Map 3: Location of Miranda municipality



Source: Elaborated by the author

Another significant event in the life of the Terena people was the Paraguayan War which occurred from 1864 to 1870. During the war, most of the Brazilian troops consisted of black slaves and indigenous people from the Mato Grosso (MT) region, such as the Guaikuru people, who fought alongside the Brazilian army. Meanwhile, the Terena, who were traditionally farmers, not only faced the Paraguayan army but also played a role in providing food for the combatants (Bittencourt and Ladeira, 2000). This event left deep marks on the social, political, and economic organization of the Terena. Prior to the war, the Terena people maintained a society with their own specific way of life, customs, and traditions rooted in the reciprocal exchange of goods, with economic and political self-sufficiency. After the war, these people were forced to establish a new society, giving rise to new social and cultural dynamics to preserve their ethos - their "identity" as a people. They began to encounter diverse and opportunistic populations, ready to compete for the occupation of a politically and socially devastated region. Consequently, the old relationship of solidarity and respect began to undergo profound

changes, and the Terena people faced discrimination, derogatorily referred to as "*bugres*" (Azanha, 2005).

A second consequence of the Paraguayan War was the dispersion of Terena villages across a vast region. This could have been a passing event, without the power to transform the Terena social structure if it were not for the loss of their traditional territorial foundations. After the conflict, when they began to return to their traditional territories, these had already been largely taken over by third parties (Azanha, 2005). From that point, a new chapter in the life of the Terena commenced, as they transitioned from being warriors in the struggle for the conquest of Brazilian territory to becoming forced suppliers of semi-enslaved labor on the farms established within their traditional territories. This phase is known to Terena as the "Times of Servitude."

3.0.2 Times of Servitude: The post-Paraguayan War

The post-war period marks the beginning of the reorganization of territorial space in the conflict zone, involving land regularization for the new occupants. This substantial undertaking of territorial reordering and frontier consolidation was only possible due to the "liberation" of indigenous lands and the compulsory use of their labor. Contemporary Terena people are familiar with this period, which, for them, extends from the immediate post-war era to the creation of reserves (Azanha, 2005).

In 1850, the Brazilian government enacted the Land Law, which stated that from that date onwards, land could be bought and sold without requiring government approval. The lands then became more valuable, since the landowners could make a profit by buying and selling them. The purpose of this law was to promote the colonization of more lands and authorize the government to sell, through auctions, unclaimed lands, which included the lands of indigenous people who no longer lived in settlements and were referred to by non-indigenous people as "docile Indians" because they lived peacefully with the "civilized." During this period, many traditional Terena territories were seized and sold, notably affecting the lives of these people (Bittencourt and Ladeira, 2000).

Terena ethnic territory was significantly divided among the remaining combatants of the war, and the displaced indigenous individuals were recruited to serve as cheap labor on newly established or rebuilt farms. As their ancestral territories were gradually invaded upon by war survivors, typically demobilized Brazilian army officers and traders

encouraged by the Brazilian government, the Terena people started leaving their places of origin and seeking refuge in more distant areas for protection (Martins, 2002). As a result, farms rapidly multiplied in the region, and the indigenous people who resisted on their lands found themselves surrounded by these farms. They were severely affected by the destruction of their crops by the farmers' cattle, making life in the villages extremely difficult. This situation compelled the Terena to find employment as laborers on the very farms that were once their traditional territories. This period has also been regarded by the Terena as a time of suffering, where they worked tirelessly for minimal wages (Miranda, 2006).

3.0.3 Rondon villages stage: reserve situation

The 20th century began with the Republican government (since 1889) playing a significant role in various initiatives for the southern region of Mato Grosso State (current Mato Grosso do Sul), which, in turn, heavily involved the Terena people in their endeavors. The Rondon Commission (1904), led by Marshal Cândido Rondon, traversed the region constructing telegraph lines and encountered small Terena communities that also worked on the construction of the Northwest Brazilian Railway. It was from this point that the so-called "Reserve Situation" was established, which corresponds to the demarcation of Terena reserves by Marshal Cândido Rondon (Fehlauer, 2004).

During that time, some of the clashes between indigenous people and invaders on their territories began to be reported in the newspapers of the country's capitals, primarily due to the actions of professional indigenous hunters hired to "clear the land" to facilitate land ownership by farmers and for land speculation. The first Republican Constitution (1891) made no reference to indigenous groups, but the increasing occupation by non-indigenous in the states of Mato Grosso and in the Amazon region compelled the government to consider new ways of engaging with various indigenous groups. For that reason, the Indian Protection Service and the Localization of National Workers established by the Republican government and initially led by Rondon was created aiming to implement a policy to address these increasingly evident issues with indigenous people (Bittencourt and Ladeira, 2000).

At the time, the major concern was establishing the rights of indigenous people to their territory, which led to the decision to create "indigenous reserves", properly delineated and controlled by government officials, with land parcels always smaller than the territories previously occupied. However, the Indigenous people could not have their opinion on that. According to Rondon (*apud* Fehlauer, 2004), the "pacified" indigenous people no longer needed to "move from place to place," and with education, they would transition from being "wild Indians" to "national workers." For this purpose, they had to be "protected" and "assisted".

The demarcation of certain areas at that time allowed for a certain restructuring of Terena's communal life, with many families returning from the farms to the villages. In Terena's oral history, this period marks the end of the "time of servitude" on the farms. At the moment, this action could have been the best solution for the people, but it was one of the main factors contributing to the generation of internal conflicts within Terena indigenous communities. The diversity of kinship groups that existed at the time was not taken into account, and they were all placed in a single reserve. Since there was a leader in each family group, grouping several families in the same space led to power struggles for leadership, resulting in conflicts among indigenous people, migration of Terena to cities, and the current separation of many villages within Indigenous Lands. "The organization of the territory, the layout of housing, cultivation, ceremonies, and other activities were not respected by the Indian Protection Service administrators" (Bittencourt and Ladeira, 2000).

Accordingly, this period was marked by greater proximity of the Terena people to non-indigenous society who were compelled to adapt through changes in habits and customs. In 1918, the Indian Protection Service (IPS) established an office in the Cachoeirinha Indigenous Land with the intention of providing support to the Terena people, as Rondon had envisioned. However, this protection soon began to erode their rights and political autonomy. The non-indigenous head of the office started to interfere in every aspect of Terena's life. The IPS conveyed to the Terena that, in the indigenous reserves, they lived at the government's caution, as if the government was doing them a favor (Bittencourt and Ladeira, 2000, p.97). One of the consequences of this phase, still experienced in Terena communities today, is forced labor on private properties, especially in alcohol distilleries, as sugar cane planters and cutters through temporary contracts. This is due to the lack of land for cultivation within the villages and the

highly exploited soil in indigenous communities, which affects the harvest. The demarcation allowed the government to release the rest of the land for cattle ranching and later, monoculture plantations such as soybean (Miranda, 2006; Viera, 2004).

3.0.4 Current Times

The space within the Reserves was insufficient because, for the IPS, the future of the Terena, as well as other indigenous groups, was to abandon their culture to work as labor in the fields and farms of large landowners or to move to the cities, assimilating the lifestyle of the non-indigenous people, abandoning their language, customs, and traditions. The IPS was not concerned with creating conditions to promote the development of Terena areas or encouraging and supporting the expansion of their agriculture so that they could have products for trade, achieve financial autonomy, and become more independent from the favors of the non-indigenous people. During the period of Military Dictatorship that began with the coup on March 31, 1964, the IPS ceased its activities, facing several corruption allegations, including the illegal sale of indigenous lands and it was replaced by the FUNAI, established in 1967 (Bittencourt and Ladeira, 2000).

The Terena people in the villages live in small islands of land scattered across municipalities in Mato Grosso do Sul, such as Miranda, Aquidauana, Anastácio, Sidrolândia, Dois Irmãos do Buriti, and Nioaque. There are also Terena families living in villages in São Paulo, where they were relocated. Surrounded by cattle ranches, the Terena areas can be characterized as labor reserves for farms and plantations, as the lack of cultivable land compels the Terena, traditionally skilled farmers, to employ their labor in activities outside the indigenous areas. In recent years, significant segments of the Terena communities have expressed concerns about reversing this situation (Bittencourt and Ladeira, 2000).

3.0.5 Awakening Time: Stage of autonomy seeking

Miranda (2006) argues that the Terena population in Mato Grosso do Sul is currently in a period referred to as the Awakening Time. According to the author, anthropologists predicted a process of acculturation among indigenous people, in which they foresaw that indigenous communities would undergo a cultural fusion as a result of contact with

white society, or adopt and assimilate white culture, thus losing their own. Nevertheless, this new phase is marked by Terena's entry into spaces that they did not previously occupy, participating in the regional economy, holding public positions, or working as professionals. Additionally, young Terena individuals are attending universities to comprehend non-indigenous sciences and, from there, devise new ways of socio-cultural survival.

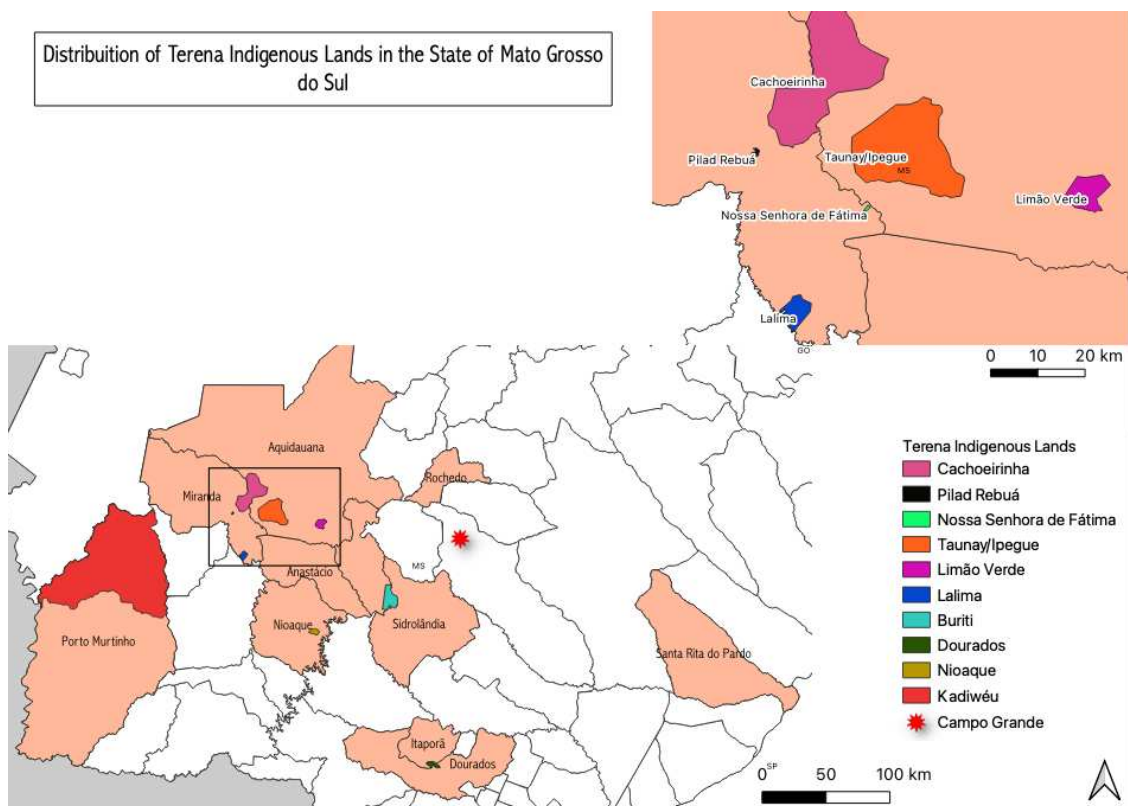
"We have always been studied; white people have always sought to understand our knowledge of dealing with nature and our territory. We have always felt disadvantaged because they study us, but it seems that the more they study our people, the more difficult it becomes for us to improve our lives. It should be the opposite, to help us. So, I see it as the 'awakening of our people' now. We want to learn the science of the whites, study, and graduate to be able to help our indigenous population. In a short time, we are capable of producing indigenous doctors, specialists to speak for ourselves, but within an indigenous reality and not from an outside perspective. Therefore, I have encouraged many young people to study, thinking about the future of our people." (Prof. Valmir Brites Rocha, 25 years old, Água Branca Village/Nioaque cited in Miranda, 2006, p.35).

According to Cabral (2002), the Terena people, mastering urban codes, have gradually taken over broader spheres, whether in universities or even making their mark in politics. These factors strengthen the argument that the Terena population is experiencing a fourth phase of their history in which they strategically seek to occupy spaces from which they can assert themselves as Terena and overturn the stereotype of the incapable, lazy, and docile indigenous seen by society. The Terena people, through their organizations, currently seek to pressure the development of governmental and non-governmental public policies strategically and systematically on appropriate scales. They are encouraged to invest in the knowledge of biodiversity and the sustainable economic management of their lands while always considering new forms of Terena territorialization. In this regard, Miranda (2006) highlights that the importance of the fourth phase of the Terena people's journey is evident. However, a significant challenge remains: to translate their growing political and organizational expressiveness into economic autonomy that can promote a certain level of social, economic, and cultural self-sustainability on indigenous lands.

3.1 Terena people and the agriculture

The Terena people are one of the largest indigenous ethnic groups in Brazil and the second-largest in the state of Mato Grosso do Sul which could still preserve agricultural production based on traditional knowledge. Currently, the Terena population is around 30,000 inhabitants spread across the following territories: (1) Taunay-Ipegue Indigenous Land (comprising the villages Bananal, Lagoinha, Morrinho, Água Branca, Imbirussu, Ipegue, and Colônia Nova) and (2) Limão Verde Indigenous Land (comprising the villages Limão Verde, Córrego Seco, and Buritizinho), located in the municipality of Aquidauana; (3) Aldeinha Indigenous Land (comprising the village Aldeinha), located in the municipality of Anastácio; (4) Cachoeirinha Indigenous Land (comprising the villages Argola, Babaçu, Cachoeirinha, Morrinho, Lagoinha, and Mãe Terra), (5) Lalima Indigenous Land (comprising the village Lalima), (6) Pilad Rebuá Indigenous Land (comprising the villages Moreira and Passarinho), and (7) Nossa Senhora de Fátima Indigenous Reserve, located in the municipality of Miranda; (8) Nioaque Indigenous Land (comprising the villages Brejão, Taboquinha, Cabeceira, and Água Branca), located in the municipality of Nioaque; (9) Buriti Indigenous Land (comprising the villages Buriti, Água Azul, Córrego do Meio, Recanto, Olho d'Água, Oliveira, Barreirinho, Tereré, Nova Tereré, Dez de Maio, Lagoinha, Nova Buriti, and Vila André), located in the municipalities of Dois Irmãos do Buriti and Sidrolândia (Vargas, 2011; Amado, 2020a); and the (10) Urban Villages Marçal de Souza, Água Limpa, Darcy Ribeiro, Tarsila do Amaral, Núcleo Industrial, Santa Monica (Tumune Kalivono) in Campo Grande (Batistoti; Latosinski, 2019) and the (11) Bálsamo Village in the municipality of Rochedo (Figueredo, 2016). It is worth noting the Terena territories whose areas are being claimed, such as the (12) Salobinha Indigenous Land in the municipality of Miranda/MS and the (13) Terena-Santa Rita do Prado Indigenous Land in the municipality of Santa Rita do Prado/MS58, in addition to the minority presence of Terena groups inhabiting the Kadiwéu Indigenous Land (comprising the villages Alves de Barros, Campina, Córrego do Ouro, Tomazia, São João, and Barro Preto) in the municipality of Porto Murtinho and in the Dourados Indigenous Reserve (comprising the villages Bororó and Jaguapirú) in the municipalities of Dourados and Itaporã (Map 4).

Map 4: Distribution of Terena Indigenous Lands in the State of Mato Grosso do Sul



Source: Elaborated by the author

Despite the influence of non-indigenous individuals who have introduced some changes, the indigenous people are committed to their efforts to preserve their agricultural traditions. These people have a unique way of learning, transmitting, and preserving their traditional knowledge. From birth, children are already involved in cultural practices such as rituals, songs, and ceremonies that mark the phases of their lives, shaping their worldview based on the values of the group to which they belong. They work in their modes of production while respecting nature, making the most of the resources that nature provides to produce their food (Miranda, Jordão, 2005).

Since ancient times, there is information that the Guaná people had a well-developed agriculture, even using a type of plow¹². Reports indicate that they cultivated maize, roots, and other fruits in a way that provided food throughout the year in their cultivated

¹² Plow is a farming tool used for cutting and turning over the soil in preparation for planting crops. It typically consists of a strong, broad blade or metal point which is drawn through the soil by animals or a tractor. The primary purpose of a plow is to break up and loosen the soil, making it more suitable for planting seeds and improving soil aeration.

fields (Oliveira, 1976). Over time, evident changes have occurred in indigenous communities, especially in agriculture, when comparing agricultural practices from ancient times to how they work in agriculture today. Before the Paraguayan War they had a sufficiently vast territory to engage in shifting cultivation, involving slash-and-burn techniques followed by fallow periods long enough for the natural soil fertility to regenerate. When they started to be confined to reserves – a fundamental factor in the transformations that occurred in their traditional agriculture – the Terena had permanent cultivation fields and made use of mechanization (tractors) for plowing, land preparation for planting, and occasionally for opening new permanent cultivation areas (Azanha, 2005).

As previously mentioned, the Green Revolution was a significant period in agriculture, which brought significant changes, beneficial for some and disastrous for others. The incorporation of elements from this process of agricultural "modernization" into Terena agriculture occurred within the institutional context of external relations that favored and promoted these options, especially concerning "community development projects" conducted by FUNAI. This reached its peak in the late 1970s and early 1980s. These projects, beyond technological proposals, also assumed the privilege of prioritizing certain crops that generated marketable surpluses, especially cereals (Fehlauer, 2004).

This process led to transformations in the agricultural practices of the Terena communities. From this period onwards, there was a gradual introduction of agricultural machinery and equipment in Terena communities, as well as the use of hybrid species in cultivation, resulting in a new way of practicing agriculture in these communities. Miranda (2006) highlights the reality of Terena communities, when faced with market demands and the impact of the new agricultural practices, were compelled to adapt to new knowledge and technologies. In addition, traditional methods for selecting seeds in the fields for planting, storage systems, and the correct timing for planting each crop, always took into consideration lunar phases and wind patterns. The Terena people believe that the moon directly influences agricultural activities, which is why they work in harmony with the moon's phases. They carry out their agricultural practices while taking into account the moon's movements, despite the advice of some agricultural experts (Miranda, Jordão, 2005). This can be observed in the words of an elder from Água Branca Village, Nioaque Municipality, Mato Grosso do Sul:

"...the moon and the wind are some of the best indicators for us indigenous people during the planting season. We don't plant any 'vining' crops during the waxing moon. Most subsistence crops are planted during the new moon. When you're planting, and it starts to blow from the south, stop and don't proceed because when the crop grows, it will become too lush and won't yield much." (Dionísio Miranda, 91 years old, Água Branca Village, Nioaque, MS, cited in Miranda, 2006, p.87)

However, Miranda (2006) argues that with the advancement of technology, these traditional knowledge systems were gradually overshadowed and replaced by an extensive recipe for agricultural development and a pre-packaged approach to farming. According to the indigenous communities, this shift was perceived as being designed to benefit large agricultural product trading companies. He explains that soil preparation in ancient times was done manually with hoes, through communal work parties where indigenous producers took turns preparing the soil in each other's fields. The motivation for such activity was the celebration held on Saturdays at the home of the community labor coordinator, marking the end of the work party week, which they called the "Tail of the Work Party." With the introduction of new technologies and the illusion that everything would be easier and better with tractors, these traditional practices began to weaken, as using tractors quickly became routine in indigenous fields. The Terena people refer to this period as the "Era of the Great Carpet," which marked the arrival of new knowledge and the suppression of local knowledge. As new technology was introduced into Terena communities, indigenous people were forced to adapt to this new knowledge.

According to Brand (2003), the knowledge of each indigenous person about nature certainly reflects their cumulative experience of seeking understanding and comprehension, which is passed down through generations, always with their cosmology as a reference. In Terena communities, this aspect is of great importance in teaching and educating the new generations about the traditional knowledge that still exists in the communities. It starts with the involvement of the elders in providing guidance about nature, cosmology, and the world. At the same time, there is a significant interest among the youth in better understanding the scientific world of non-indigenous sciences.

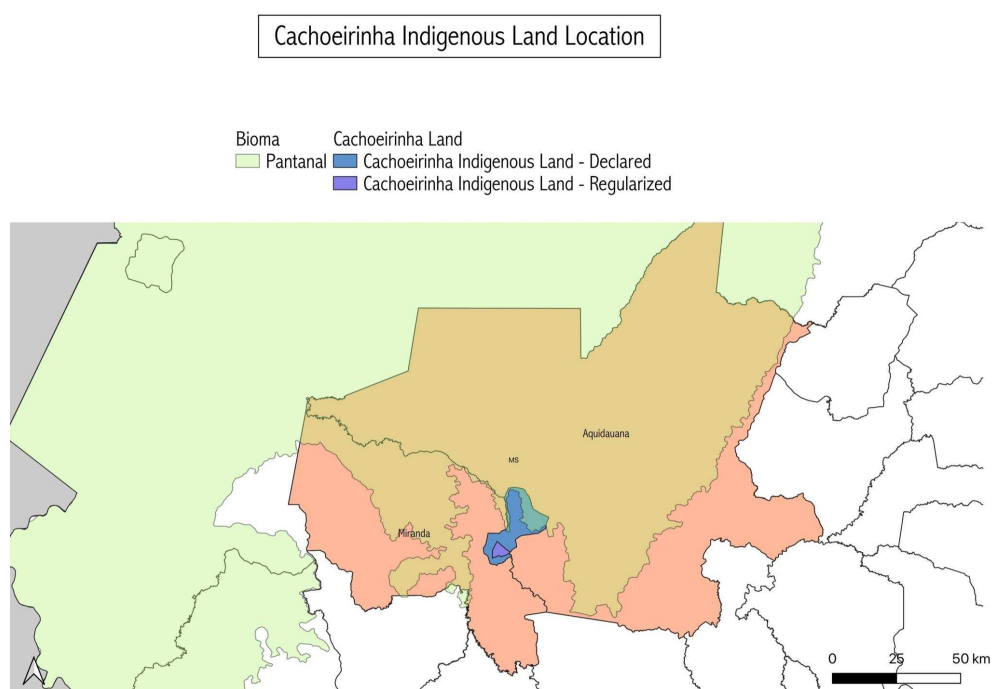
4.0 The GATI Project in the Cachoeirinha Indigenous Land

As noted previously, this research centers on a case study approach examining the Cachoeirinha Indigenous Land that is renowned for its efforts in agroecology. The study focuses on qualitative research with the data collection based on one single interview with a participant of the CAIANAS organization conducted in December 2023, in some reports elaborated by the project coordinators and academic literature. However, not being able to be physically present in the territory has proven to be a constraint for the study. This limitation has restricted contact with the key individuals involved in the GATI project, as interactions have been conducted remotely.

4.1 Cachoeirinha Indigenous Land

The Cachoeirinha Indigenous Land is located in the municipality of Miranda, in the state of Mato Grosso do Sul (MS), extending to part of the municipality of Aquidauana/MS (Map.5). It was regularized with 2,644 hectares and comprises the villages: Cachoeirinha, Babaçu, Morrinho, Argola, Lagoinha, and Mãe Terra. Traditionally inhabited by the Terena people with a population of 3,314 individuals. The historical occupation areas of the Terena cover non-floodable lands in the basins of the Miranda and Aquidauana rivers, extending into the floodable areas of these same basins. In these locations, they traditionally engaged in cattle herding, and currently, activities like hunting, gathering, and fishing persist. The Cachoeirinha Indigenous Land lies in the Pre-Pantanal Plain since it does not suffer from the characteristic floods of the Pantanal biome. The Ministry of the Environment designates this area as a high-priority zone for biodiversity and knowledge conservation, offering opportunities for sustainable projects and degraded area recovery within the Indigenous Land (Benites *et al*, 2016).

Map 5: Cachoeirinha Indigenous Land Location



Source: Elaborated by the author

Managed by the Local Technical Coordination of Miranda, linked to the Regional Coordination of Campo Grande, the area of the Cachoeirinha Indigenous Land is undergoing boundary revisions. In 1982, a process was initiated to study and review the boundaries of the Cachoeirinha Indigenous Territory with the goal of expanding its reserved area from 2,660 hectares. In 1999, FUNAI established the formation of a Working group to conduct studies for the identification and revision of the boundaries of the Cachoeirinha Indigenous Territory. As a result of these efforts, an area of 36,288 hectares and 100 kilometers in length was identified for the Indigenous Territory (Azanha, 2000).

However, the administrative procedures were halted by the Ministry of Justice in 2003 which led the leaders of the Cachoeirinha Indigenous Land to create strategies to carry out the demarcation of the territory in collaboration with the Terena communities of Lalima and Pilad Rebuá Indigenous Territories, located in the municipality of Miranda

(MS). The discussions received support from the Indigenous Missionary Council to pressure on the actions of the state agencies responsible for demarcation (Ferreira, 2007).

In 2007, the Ministry of Justice recognized the area of 36,288 hectares as traditionally occupied and permanently possessed by the Terena people. Therefore, from the administrative process perspective, the Cachoeirinha Indigenous Land is "declared,"¹³ awaiting the physical demarcation of the area by FUNAI officials, including the installation of signs and an assessment of improvements. However, this does not mean an improvement in the precariousness of the occupation of the retaken lands, exposing the Terena families to violence and threats due to the land conflict. In 2006, there was a criminal fire in part of the crops, and the following year, threats to set fire to the crops and houses in the occupation persisted (CIMI/MS, 2007)¹⁴. There are numerous records of threats and violence carried out by rural landowners, such as the occurrence of criminal fires in the crops, threats, attempted homicides, as in the case of the school bus transporting 30 Terena students when it was attacked with stones and Molotov cocktails in 2011 (Viegas; Rafael, 2011)¹⁵.

Since 2007, the demarcation process has not progressed. The ranchers who have invaded areas identified as traditionally owned by the Terena people do not allow FUNAI officials to enter for the marking of the physical boundaries of the Cachoeirinha Indigenous Land. As long as the demarcation is not finished, the indigenous people remain without the assurance of land ownership, leading to increased internal disputes within the villages due to limited space. At the same time, rural producers lack legal

¹³ The Federal Constitution of 1988 provides for the demarcation of indigenous lands as a constitutional right. This process consists of several stages, namely:

i) *Identification Studies*: Appoints an anthropologist to prepare an anthropological study and coordinate the work of the specialized technical group that will identify the Indigenous Land in question; ii) *FUNAI Approval*: The report of the anthropological study must be approved by the presidency of FUNAI; iii) *Contests*: Interested parties have a period after the publication of the report to express their opinions; iv) *Declaration of Boundaries*: The Minister of Justice can declare the boundaries of the area and determine its physical demarcation or disapprove the identification; v) *Physical Demarcation*: Once the boundaries of the area are declared, FUNAI carries out the physical demarcation; vi) *Homologation*: The demarcation procedure must finally be submitted to the President of the Republic for homologation by decree; vii) *Registration*: The demarcated and homologated land is registered in the real estate registry of the corresponding region and in the Secretariat of Union Assets. Source: <https://terrasindigenas.org.br/pt-br/demarcacao>

¹⁴ Available at: <https://cimi.org.br/2007/06/26222/>. Accessed in Jan. 2024

¹⁵ Available at: <https://g1.globo.com/mato-grosso-do-sul/noticia/2011/06/em-ms-onibus-com-alunos-indigenas-e-incendia-do-com-coquetel-molotov.html>. Accessed in Jan. 2024

certainty, faced with a demarcation process that is practically stalled within FUNAI (APIB, 2020).

Besides the struggles with the land demarcation, the Cachoeirinha Indigenous Land has stood out in the making of Terena ceramics and boasts groups of women with specific expertise in this field, including an association of female ceramicists. Currently, they travel to other Indigenous Lands to provide ceramic production workshops for other Terena women (Miranda, 2006). Cachoeirinha previously had several community-based associations, some formed due to specific funding sources that supported individual projects. With the conclusion of these financings, the associations ceased their activities. Currently, the body that remains active is CAIANAS (Indigenous Environmentalist Collective for Nature, Agroecology, and Sustainability), composed of families involved with the GATI Project. Other currently inactive associations include the Mãos Unidas Association, Argola Rural Producers Association, Terena Indigenous Association of Cachoeirinha (Aiteca), Reviver Association, and the Women's Association.

4.2 GATI activities in Cachoeirinha Indigenous Land

The GATI Project began its activities within the Cachoeirinha Indigenous Land around mid-November 2011, initiating a clarification meeting to gather demands and expectations related to the Project. By May 2012, the Project had its presentation during the Arpinpan Assembly (Articulation of Indigenous Peoples of the Pantanal) held in Campo Grande, Mato Grosso do Sul. In October 2012, the establishment of the Pantanal/Cerrado Regional Deliberative Council occurred in the same city, engaging in discussions about actions and projects while officially appointing Leosmar Antônio (as primary) and Inácio Faustino (as alternate) as consultants of Cachoeirinha Indigenous Land. The Regional Consultants' main objective was to explain the GATI Project and gather the demands and expectations of the communities regarding the actions to be developed in the territories. During that year, the concepts and objectives of the GATI project were widely debated by the community, with several meetings with the chiefs, leaders and the population of villages to present the project lines and their execution (Benites *et al*, 2016; Salomão, 2023).

Fig. 4. Beginning of internal mobilizations and council meeting in Campo Grande in February 2012¹⁶



While discussing the project's lines of action, the community of the Cachoeirinha Indigenous Land showed interest in the proposals for implementing Agroforestry Systems, which, in addition to converging with the ongoing environmental recovery and food production actions in the territory, correspond to the agricultural ethos of the Terena people (Salomão, 2023). In that way, the focal points for the area encompassed: establishing Agroforestry Systems; rehabilitating basins, reservoirs, and water sources through reforestation, alongside other initiatives; renovating degraded zones; educating environmental agents, and managing waste (Benites *et al*, 2016).

The GATI Project promoted a range of initiatives focused on agroforestry practices within Cachoeirinha Indigenous Land. These efforts included workshops specifically tailored to Agroforestry Systems designed to foster ecological restoration and enhance backyard gardens and fields. Among the main workshops held were:

- i) Workshop on agroforestry with planting practice, held from February 4th to 6th, 2013. This was the first workshop conducted at the Indigenous Land and proved important in directing the activities developed in the region;

¹⁶ Source: <https://www.facebook.com/profile/100064694803104/search/?q=GATI>

ii) Seed workshop, agroforestry planting, and native seed fair on February 22nd and 23rd, 2013. The workshop took place at Pirakuá Indigenous Land during the 2nd Regional Council meeting and had the participation of representatives from Cachoeirinha Indigenous Land;

iii) Composting and Agroforestry Systems workshop involving professors and students from the Federal Institute of Mato Grosso do Sul, State University of Mato Grosso do Sul, and Federal University of Mato Grosso do Sul. The workshop occurred in May 2013 (Benites *et al*, 2016).

Through discussions involving families engaged in the GATI Project, along with members of the Funai Campo Grande Regional Council and regional consultant Graziella Sant'Ana, plans for agroforestry systems were formulated and presented to the Council. Consequently, agricultural resources, seeds, and 1,261 seedlings of both native and exotic fruit-bearing and timber species were obtained in response to these requirements. These seedlings were subsequently distributed among the families residing in Cachoeirinha Indigenous Land. Following their participation in exchanges, training sessions, and Agroecology-centered events, specifically trained indigenous individuals—especially GATI council members—conducted a sequence of workshops within the Indigenous Land. As a result of this work, emerged the "GATI Family," a group of families dedicated to practicing the teachings from the workshops, evolving into a collective of agroforestry systems farmers (Miller *at al*, 2016)

Further actions associated with agroforestry initiatives included the formation of farmer associations and the establishment of an organization. A workshop was offered to representatives of the 'GATI Family' who aimed to form agreements, apply for grants, and strengthen partnerships to develop socio-environmental projects grounded in agroecology. Following the workshop, they formed an organization called 'CAIANAS'¹⁷- the Indigenous Environmentalist Collective for Action in Nature, Agroecology, and Sustainability.

As an organization, they have impacted and assisted various groups including women, youth, children, elders, families, and territories through diverse initiatives. These actions

¹⁷ "The name 'Caianas' is also a reference to the 'Kayanás' (in Terena language, 'kaya' means 'brain'), a segment of the Terena social organization traditionally composed of wise individuals and intellectuals" (Antonio, 2016, p.37)

encompass restoring springs and degraded areas, implementing planting methods in traditional agricultural systems and agroforestry systems, rejuvenating indigenous varieties, establishing a seed repository, propagating and disseminating seedlings, integrating dialogues about traditional Terena agriculture into indigenous schools, and preserving traditional knowledge and spirituality, among other efforts. Additionally, CAIANAS organizes educational programs and training sessions focusing on ethno-environmental subjects, publishes informational booklets, engages in and facilitates exchanges with other indigenous communities and agroecological groups, actively participates in environmental events, and provides support for research and academic pursuits by mentoring undergraduate students during internships and aiding researchers¹⁸

Furthermore, there was also the implementation of micro-projects which were integral to bolstering Agroforestry Systems initiatives. Notable micro-projects included:

- i) *'Agroforestry Systems Workshops in Cachoeirinha, Taunay/Ipegue, and Lalima Indigenous Lands'*, led by Leosmar Antônio, who conducted numerous workshops between 2013 and 2014 in these respective Indigenous Lands;
- ii) Support the Agroforestry Farmer Course, in Cachoeirinha Indigenous Land, 2014. This microproject supported the Agroforestry Farmer course, covering expenses such as meals, payment for cooks, and printing of documents and course materials;
- iii) *'Caianás Space: Initial occupation, construction of a rustic shed, and the beginning of spring restoration'*, in Mãe Terra village (2014-2015). This marked the initial occupation action in the 'Kayanas Formation Space,' involving the construction of a rustic shed and the commencement of the first activities installing agroecological productive systems and spring restoration;
- iv) *'EducomHorta: Food Security and Environmental Education'*, in Cachoeirinha Indigenous Land (2014-2015). The proposal was conceived by the leadership and community of Lagoinha Village in partnership with the Alexandre Albuquerque Municipal Indigenous School Extension. The project promoted vegetable cultivation, implemented agroforestry, and through interdisciplinary teaching, conducted dietary

¹⁸ Available at: <https://caianas.org.br/quem-somos/>. Accessed in Jan. 2024

re-education focusing on the nutritional value of vegetables. The initiative also encompassed environmental education;

v) *'Women's Group Garden: Food Security and Environmental Education.'* Led by Vaneide Turibio Julio, Cachoeirinha village (2014);

vi) *'Strengthening Traditional Terena Agriculture: Agroecological, Diverse, and Sustainable Production.'* The project, developed in 2015, supported family units (around 25 people) in agroecological transition. Diversified plantings were carried out, introducing trees as an alternative to the prevailing conventional agriculture model (Benites *et al*, 2016)

The GATI project also supported the project *'Strengthening and Expansion of Agroecological Actions in Cachoeirinha Indigenous Land'* between 2015 and 2016. The initiative was proposed by Caianas Organization and aimed to enhance agroforestry systems activities in the Indigenous Land by incorporating fruit-bearing and timber species, contributing to biodiversity, spring recovery, and promoting traditional seed fairs.

The training processes supported by the GATI Project at Cachoeirinha Indigenous Land also had agroecology as a cross-cutting theme and its integration among the Terena people. The approaches varied from specific training sessions to others of a short to medium-term continuous nature. The first action carried out was the extension project called *'Sowing Agroecological Knowledge Course for the Sustainable Development of Indigenous Communities'*. The initiative was coordinated by the State University of Mato Grosso do Sul and the GATI Project, with support from the Regional Coordination of Funai in Campo Grande. Sixty farmers from the Terena Reference Areas were trained. The initiative strengthened the community, fostering the production of healthy food and promoting sustainable self-management of natural resources. The course lasted 12 months, from April 2015 to May 2016, and was developed based on prior needs assessment and discussions with leaders and families involved in the GATI Project from Lalima, Cachoeirinha, and Taunay/Ipegue Indigenous Lands. Cachoeirinha Indigenous Land participated in several workshops, such as:

i) Construction of the Terena Agricultural/Cultural Calendar - The workshop took place on April 25th and 26th, 2015, in Mãe Terra Village. The objective was to systematize

the Terena agricultural/cultural calendar, incorporating information from the traditional agricultural system. The calendar recorded planting and harvesting seasons, soil preparation, and lunar phases. The intention was to assist farmers in planning agricultural activities for better productivity and preservation of Terena knowledge. The calendar also included periods for fishing, honey collection, and traditional festivals;

ii) Workshop on Biofertilizers and Alternative Inputs: held on June 26th and 27th, 2015, in Babaçu Village/Cachoeirinha Indigenous Land. The primary goal was to provide low-cost, easily applicable, efficient, and environmentally safe alternative inputs for farmers;

iii) Workshop on Management and Reorganization of Agroforestry Systems: conducted on July 30th and 31st, 2015, at Cachoeirinha Indigenous Land, directly within the Terena Agroforests established in early 2014. It aimed to discuss sustainability, reorganization of SAFs, and planning for the implementation of new areas;

iv) Workshop on manioc processing and utilization: occurred in December 2015 and was led by a technical researcher from the Agricultural Development and Rural Extension Agency of Mato Grosso do Sul. Women from the Indigenous Land, including representatives from Lalima Indigenous Land, participated in the workshop, exchanging experiences on recipes derived from manioc, such as cakes, juices, gnocchi, sweets, and others.

Another important initiative was the '*Kayanas*' *Training Space*, which was one of CAIANAS Organization's key projects. The Kayanas Space emerged after discussions and reflections stemming from the experiences gained during exchanges in 2013 at indigenous training centers in Acre and Roraima. Its primary objective is to foster dialogue and studies on autonomy, socio-environmental issues, and cultural experiences of the Terena people. The Space also aims to host cultural events and environmental and cultural training courses. It was built in an area near several springs and a stretch of forest, symbolically important as it is where 30 Terena families camped in 2005 during the reclamation of this part of the traditional territory, which was excluded from demarcation. According to its creators, the Space reflects the future vision of the Terena people (Benites *et al*, 2016).

Moreover, there was the development of an Agroforestry Farmer Course offered to 30 individuals from Cachoeirinha Indigenous Land, conducted by the Federal Institute of Mato Grosso do Sul in partnership with the GATI Project under the National Program for Access to Technical Education and Employment. The course's design included the participation and organization of families involved in the GATI Project, especially the "GATI Family," organized within the Caianas collective. Hence, the course was entirely proposed, designed, and conducted jointly with indigenous people (content, class days, pedagogical dynamics, participation of indigenous teachers, logistics, etc.). Regarding the curriculum, the training aimed to incorporate and/or awaken participants to the analysis of the benefits and advantages of agroecological production. Aspects involved in agroecology, such as economy, environmental recovery, healthy nutrition, soil quality, and biodiversity preservation, were emphasized. The course comprised 200 hours, lasting for five months (April to September 2014). It took place on weekends in the villages of Argola, Babaçu, Cachoeirinha, Lagoinha, and Mãe Terra (Benites et al, 2016).

Fig. 5. Activity of the Agroforestry Farmer Course conducted in 2014¹⁹



¹⁹ Source: <https://www.facebook.com/profile/100064694803104/search/?q=GATI>

Finally, the last initiative was the insertion of the theme "Terena Agroecology" in Terena municipal schools in Mãe Terra and Lagoinha villages. The GATI Project, together with indigenous leaders and teachers from Mãe Terra and Lagoinha villages, coordinated with the Municipal Education Secretary of Miranda city to integrate the theme "Terena Agroecology" into the pedagogical political projects of their schools. Initially, the goal was to implement this integration specifically in kindergarten and the initial phase of Elementary Education. One of the primary activities carried out to achieve this objective was an exchange program to the Municipal Indigenous School Ñandejára Pólo, in Te'yikue Village within the Caarapó Indigenous Land (MS), and to the Lagoa Grande Settlement. These places showcase successful initiatives in environmental education and agroforestry systems developed by Embrapa (Brazilian Agricultural Research Corporation). The trip took place from November 17th to 21st, with the participation of 11 Terena representatives from Cachoeirinha Indigenous Land, including teachers, leaders, and parents of students. GATI also supported the participation of indigenous individuals from Mato Grosso do Sul in the 3rd National Agroecology Encounter. The event took place at the campus of the Federal University of Vale do São Francisco in Juazeiro (BA) from May 16th to 19th, 2014 (Benites et al, 2016).

Fig. 6. Alternative Inputs Workshop in Babaçu Village, within the scope of the Agroecological Practices Course²⁰



4.3 GATI's impacts

As already mentioned, the Terena people considered themselves fundamentally as farmers. Many traditional agricultural practices are still carried out within Indigenous Lands but this has been hampered by some aspects such as the size of the Indigenous Land, which does not provide enough space for the entire population, a number that increases every year; the introduction of modern agriculture techniques, characterized by the use of fertilizers and monocultures, which associated with the global trend of declining grain prices over the decades, has not allowed Terena farmers to generate a minimum income from their fields to sustain their families, at least within this agricultural model (Benites *et al*, 2016).

Despite their recognition of great farmers, there was also an awareness that the adoption of "misguided models" of production has weakened the autonomy of indigenous agricultural activity, leading to environmental degradation. In this context, the proposal for ecologically-based agriculture, an "indigenous agroecology" led by the indigenous people themselves, caught the attention of the Terena who were engaging in actions

²⁰ Source: <https://www.facebook.com/profile/100064694803104/search/?q=GATI>

through the GATI Project within the Cachoeirinha Indigenous Land. This interest was solid within the leadership group of the Mãe Terra Village (Benites *et al*, 2016). However, as presented by Salomão (2023), at the project's outset, the community showed concerns about involving FUNAI and other government entities. These concerns stemmed from past unsuccessful experiences and a historical pattern of implementing policies that disregarded their interests. Additionally, the elders raised questions about the stance of state representatives who, in their view, placed the responsibility on Terena farmers for adopting modern agricultural planting techniques.

The firsts workshop - *Agroecological Production in Successional Agroforestry* - conducted at the community discussed the origin of Agroforestry Systems technology and its relationship with indigenous knowledge and practices. It was an exchange of knowledge and experience that involved different segments of the community and had the participation of elders as custodians of Terena wisdom. They engaged in discussions and adapted agroecological practices to traditional knowledge. Families began to realize that the principles of Agroecology aligned with Terena knowledge, providing an alternative to modern agriculture and a path towards environmental recovery and conservation (Sant'Ana, Melo, 2016).

Fig. 7. First workshop conducted by the GATI project in the Cachoeirinha Indigenous Land in February 2013



Source: Sant'ana; Melo, 2016, p. 17

In that regard, a first impact of GATI's activities was to reattach Terena farmers with their traditional agricultural practices that had been forgotten. According to Neiriel Terena, a member of the CAIANAS organization, this meant a reconnection with the spiritual aspect of Terena agriculture. For the Terena people agriculture is not solely about planting tree species and crops, as advocated by some technical and scientific approaches. For them, the cultivation of these plants should be linked with spirituality. Thus, when Terena farmers plant or collect seeds, there is a blessing process. This ritual is made so enchanted beings can protect the seeds and produce prosperous fruits. The blessing is performed by the elders of the villages, who are knowledgeable in shamanism and traditional healing practices. They teach the younger generation not only how to cultivate but also the necessary communication with the enchanted beings²¹.

Another important milestone of this first workshop was the starting point of the 'GATI family' creation. Arildo Cebalio, coordinator of the CAIANAS Organization,

²¹ Available at: <https://www.lupadobem.com/agroecologia-e-sabedoria-indigena-recuperam-areas-degradadas-do-povo-terena/> Accessed in Dec. 2023

highlighted that this was the point in time when the notion of establishing the organization began to take shape. Recognizing that GATI was a government initiative with a predetermined conclusion, they realized the importance of maintaining its operations rather than stopping them.²² The GATI Family began to centralize the execution of the GATI Project, focusing its efforts on enhancing knowledge in Agroforestry and Terena Agriculture. The families realized that the theoretical and practical framework of Agroecology could also be an alternative to address the issues of resource scarcity, food insecurity within the community, and the challenges posed by climate change as observed by Terena farmers (Antonio, 2016).

Following the workshop's conclusion, the group decided to continue their meetings since constant technical assistance from the GATI Project would not be feasible, considering there were five other Indigenous Lands in the region to be attended to, among other activities outlined in their contract. The group started organizing collective efforts during weekends to establish and manage agroforests in the participants' yards. Before these collective efforts, they would gather to collectively plan the agroforest, to be established based on the available seedlings and seeds brought by the participants. In this way, they discussed and applied the knowledge gained during the initial workshop, incorporating additional insights such as Terena's agricultural and environmental knowledge, which were often aligned with agroecological principles (Benites *et al*, 2016).

In this manner, through these initial workshops promoted by GATI, the Terena people had their first encounter with the formal and scientific concept of agroecology. At that moment, they comprehended that this type of agriculture had been practiced since the origins of their community but had gradually faded over time due to the influence of modern practices induced by the Green Revolution, as previously mentioned. In this regard, the concept of agroecology introduced by GATI emerged as a way to reconnect the Terena people with their ancestral roots. This blend between the scientific concepts of agroecology and the Terena's cultural approach they called etnoagroecology Terena. According to Leosmar Antonio (*apud* Salomão, 2023), the agroecological discussion within the academy is restricted to social, environmental, and economic aspects.

²² Available at:

<https://www.lupadobem.com/agroecologia-e-sabedoria-indigena-recuperam-areas-degradadas-do-povo-terena/> Accessed in Dec. 2023

However, from Terena's point of view agroecology is also linked to the spiritual and the territorial dimension.

Moreover, Arildo states that the revival of agricultural and food culture, however, has not been a simple task. There is a common belief in the community that it is better to be a worker in a farm and pay someone to plant a bit of manioc and beans than to reclaim and cultivate one's land. For him, the challenge lies in people's understanding of what agroecology is and the economic possibilities tied to cultivation. He recalls experiencing a 'reality check' when participating in the first agroecology workshop: 'It was as if a veil had been lifted; that's when I realized I could work and earn money from my land.'²³

Since agroecology was implemented in the villages, it is estimated that 30 varieties of manioc and six types of beans have been recovered. These varieties were identified with the elders. Arildo explains that another struggle was raising awareness among his generation about the importance of this knowledge. He exemplifies that a person unfamiliar with a specific tree might assume it is worthless, but in reality, it could serve a purpose that has yet to be discovered. It might possess medicinal qualities, artisanal uses, and more. Ultimately, it will have its function. The same happens with medicinal plants. He recalls having a pharmacy in his land, but he did not know it because he had not yet identified all the medicinal plants. That is why he stresses the importance of the actions that CAIANAS is promoting through the recovery of this knowledge.²⁴

Another factor that contributed to the success of the GATI Project in the Cachoeirinha Indigenous Land was the establishment of strong partnerships with local institutions, including the Federal Institute of Education, Science, and Technology of Mato Grosso do Sul (IFMS) and the State University of Mato Grosso do Sul. The idea of accessing a course offered by the National Program for Access to Technical Education and Employment arose from a collaboration between the GATI regional consultant, Terena's counselors Leosmar and Inácio, and an IFMS professor. The course aimed to meet the demand of the group associated with the GATI Project that sought greater knowledge and practical guidance in the field of agroecology. Classes took place on weekends,

²³ Available at: <https://www.lupadobem.com/agroecologia-e-sabedoria-indigena-recuperam-areas-degradadas-do-povo-terena/> Accessed in Dec 2023

²⁴ Ibid.

rotating through the six villages of the Cachoeirinha Indigenous Land. Among the 40 enrolled students, including farmers, teachers, students, and leaders, there were 22 women and 18 men, ranging from 16 to 73 years old with educational backgrounds varying from incomplete primary education to complete university education. This diversity was a strong point of the course, fostering an environment conducive to rich exchanges of knowledge and perspectives. Out of the 40 enrolled students, only 9 dropped out, which was considered an excellent retention rate within these kinds of courses (Benites *et al*, 2016).

Concurrently, the Regional Coordination of FUNAI in Campo Grande acquired 26 "kits" containing tools, supplies, and equipment such as water tanks, which was essential for the students to put the knowledge being taught into practice. This was a successful initiative accessing a program that initially was not designed for the indigenous population, but through the engagement and partnerships established by the Terena people and their allies, it was redirected to create a truly distinctive course that surpassed the expectations of all involved (Benites *et al*, 2016).

Currently, GATI's efforts are reflected through the actions carried out by the CAIANAS Organization. The collective provides technical agroecology advice to families within the Cachoeirinha Indigenous Territory, as well as in other villages within and beyond the state. In addition to promoting ancestral agriculture, they also engage in ethno-environmental education, seed collection, and protection, supporting other Indigenous communities and collectives with soil restoration and food security initiatives. Many individuals volunteer their contributions to the development of CAIANAS' projects²⁵.

The themes of agroecology, agroforestry, and ecological restoration introduced by the GATI Project found fertile ground with the Terena people of the Cachoeirinha Indigenous Land. They proved to be tools not only to address other needs, such as the production of healthy food and the revival of culture but were also in complete coherence, particularly with the overarching goal of fighting for land rights and

²⁵ Available at: <https://www.lupadobem.com/agroecologia-e-sabedoria-indigena-recuperam-areas-degradadas-do-povo-terena/> Accessed in Dec. 2023

autonomy. Simultaneously, these initiatives fostered convergent actions aimed primarily at reinforcing the philosophy and values of traditional Terena agriculture (Miller et al,

Through heirloom seeds²⁶ and ancestral knowledge, they have already reclaimed approximately 30 hectares of degraded land near the Pantanal. The success is attributed to the planting of trees combined with the cultivation of roots, grains, vegetables, and flowers, all in the same space and in an organic manner, meaning without the use of pesticides. This practice enriches the soil and protects water sources. Furthermore, it promotes agricultural diversity, ensuring autonomy and food security. In this process, various varieties of edible plants that had been forgotten over time have been reintroduced. Consequently, ancient traditional dietary habits have also been reinstated, improving the health of the local population²⁷.

Finally, All GATI efforts were only successful in the Cachoeirinha Indigenous Lands thanks to Terena's engagement in all activities. According to Neiriel Terena, member of CAIANAS Organization, the high level of participation was due to the fact that the consultants and instructors were part of the community. In that way, there was not the feeling that they were receiving information from an 'outsider' but it was from someone who understood their needs, culture and traditions. All of these aspects made possible the success of the GATI project in the Cachoeirinha Indigenous Land.²⁸

²⁶ "heirloom seeds refer to open pollinated seeds/plants that have been handed down from generation to generation - generally a variety that is at least 40-50 years old, is usually no longer available in the commercial seed trade and that has been preserved and kept true in a particular region." Source: <http://www.organicseed.co.za/content/6-what-are-heirloom-seeds#:~:text=The%20terms%20heirloom%20and%20For,true%20in%20a%20particular%20region>.

²⁷ Available at: <https://www.lupadobem.com/agroecologia-e-sabedoria-indigena-recuperam-areas-degradadas-do-povo-terena/>. Accessed in Dec. 2023

²⁸ Interview done in Dec. 2023

Conclusion

The emergence of agriculture fundamentally altered human-nature relationships, enabling sedentarization, population growth, and technological advancements. However, capitalist agricultural practices, notably marked by the Green Revolution in the late 1960s and early 1970s, deepened societal and environmental divides. Despite promises to eradicate hunger, the Green Revolution primarily benefited large-scale operations, exacerbating socio-environmental impacts such as contamination, erosion, and rural marginalization. This model centralized power, commodified resources, and marginalized indigenous wisdom, amplifying the disconnect between agriculture and sustainability. In Brazil, this process intensified land concentration, excluded traditional populations, and perpetuated developmental inadequacies, underscoring the failure of conventional strategies to address hunger, poverty, and ecological degradation, while spurring global opposition to industrial agriculture.

In this regard, agroecology emerges as a grassroots response, advocating for a paradigm shift towards more harmonious human-nature relationships and social equality. It emphasizes the dignified survival of agricultural practitioners and the planet through sustainable resource management and biodiversity conservation. Agroecology not only proposes a new approach to agriculture but also envisions the construction of a sustainable society, redefining the roles of the market, consumption, and knowledge production. Central to this approach is the valorization of traditional knowledge and the empowerment of local communities, positioning farmers as key agents of their own development.

Indigenous communities in Brazil maintain the land, reflected in their holistic agricultural practices rooted in social, cultural, and spiritual aspects. Indigenous agricultural methods prioritize agrobiodiversity and ecosystem stewardship, adapting cultivation techniques to local conditions and natural cycles. However, the encroachment of agricultural and economic expansion poses significant socio-environmental threats to Indigenous Lands, leading to habitat fragmentation, resource exploitation, and institutional challenges. Efforts like the GATI project aim to empower indigenous participation in environmental and territorial management, emphasizing respect for indigenous knowledge and collaborative solutions based on local contexts.

In that way this study aimed to analyze the impact of the GATI Project on agroecology development within the Cachoeirinha Indigenous Land. Emphasis was placed on recognizing agroecology's significance as a sustainable development approach that contributes to the preservation of the traditional knowledge of the Terena people.

One of the factors that led the GATI project to promote agroecology in the Cachoeirinha Indigenous Land was the way it was formulated. The fact that GATI involved the indigenous peoples in all stages of the process, from development to consulting the communities about the activities to be carried out in the territory, allowed them to be the protagonists of the entire process. This bottom-up approach enabled them to decide what would be most interesting for them to do.

As stated by Tufté and Mefalopulos (2009) one condition for successful participatory approaches is the articulation of local ownership of the problem and related solution. “communities” often are seen by many practitioners as the turning point of bottom-up solutions. Through community participation, local residents become agents of change rather than passive recipients of interventions, fostering a sense of ownership and empowerment. This bottom-up approach is crucial when developing community projects as it ensures that initiatives are tailored to the specific needs and context of the community, thereby increasing their relevance, effectiveness, and sustainability. It embodies a direct form of democracy where individuals have the opportunity to contribute to shaping the future of their communities by voicing their opinions, needs, and aspirations.

As a result of this methodology, there was significant involvement and engagement of the inhabitants of the Cachoeirinha Indigenous Land in the activities developed. As noted, their participation levels were notably high, likely because community members themselves led certain initiatives. Therefore, there was not the feeling of an 'outsider' merely 'teaching' the indigenous population, meaning a departure from past project implementations. Furthermore, the fact that the Terena have historically been a people with a culture of agriculture can also be seen as a determining factor for the interest of the participants.

Throughout the implementation of the project activities, the Terena people gradually realized that agroecology was merely a technical term for something they had been

practicing throughout their history, but which was gradually being lost. In this sense, they saw agroecology as a way to reclaim their agricultural practices, especially concerning the spiritual aspect. As highlighted by Gonçalves *et al.* (2021), the connection between the indigenous community and nature signifies a deep link to religiosity. For these peoples, agroforestry holds significance beyond mere cultivation; it embodies a spiritual realm inhabited by souls and spirits, crucial for their cultural preservation. Therefore, as the activities of the GATI project progressed, it became apparent that the spiritual aspect could be reclaimed and fully incorporated into agroecological practices. Thus, the Terena people refer to the agroecology practiced by them as ethnoagroecology.

Finally, an important factor enabling the advancement of agroecology within the Terena community has been the establishment of the CAIANAS organization. Thanks to CAIANAS, not only were activities initiated, but various projects have been consistently developed and implemented to this day, ensuring the ongoing progress and sustainability of agroecological initiatives within the community.

Limits and constraints

One of the constraints identified when conducting this research was the unavailability to be fiscally in the territory, thus, the contact with the interested ones was limited to virtual means. A second aspect was the low number of interviews. The first idea was to be in touch with different actors that were involved in the project, however, due to the physical constraints only one conversation was done. This points to one of the limits of this study which was that the experiences reported were limited to one person and to other interviews and reports done by third parties. Lastly, this research was not meant to embrace a detailed list of impacts of the GATI project, but rather give an overview showing that when the project is done in partnership and giving the protagonist to the communities fruitful results can be achieved.

Follow up and research opportunities

This work was based on a single case study, thus, despite the considerable success of the GATI project in the Cachoeirinha Indigenous Land, it cannot be asserted that this outcome was achievable in all Lands participating in the project. Dias (2020) shows that in the Oco'y Indigenous Land there was a lack of dialogue and community leadership in

decision-making and implementing activities. In this regard, further research could be done encompassing more communities involved with GATI, in order to investigate different kinds of results and what could be the aspects that would produce these diverse outcomes. What conditions have produced different results? How future projects could be improved based on the difficulties and flaws of GATI?

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