



Panorama of the Ecological Restoration in Matopiba & Public Policy Benchmarking



SUMMARY





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Execution

Agroicone

Senior Researcher & Partner

Laura Antoniazzi

Researcher

Bruna Oliveira de Córdova

Public Administration Intern

Nicole de Sousa

Revision

Jacqueline Pereira

Legal Consultant

Isabella Pearce (Virtú Ambiental)

Translation

Douglas Oaten

Graphic Design & Diagramming

Renata Fontenelle

Cover Photo

Rui Rezende

Support

Land Innovation Fund for Sustainable Livelihoods

Project Implementation Lead

Mariana F. G. Galvão

Communication Lead

Cíntia Borges

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SUMMARY

- 1 INTRODUCTION.....7**

- 2 THE CERRADO AND THE MATOPIBA REGION.....10**
 - 2.1 Soil use and conservation.....14
 - 2.2 Deforestation.....16
 - 2.3 Economic aspects.....17

- 3 ECOLOGICAL RESTORATION IN MATOPIBA.....19**
 - 3.1 Difficulties for restoring the native vegetation.....24

- 4 LEGAL ASPECTS THAT IMPACT RESTORATION IN BRAZIL AND IN THE MATOPIBA.....26**

- 5 PUBLIC POLICIES THAT MAKE RESTORATION ADVANCE IN BRAZIL.....34**
 - 5.1 Benchmarking for improving public policies.....35
 - 5.1.1 Initiatives raised.....36
 - 5.1.2 Relevance and impact analysis.....38

- 6 FINAL CONSIDERATIONS:
BOTTLENECKS AND OPPORTUNITIES FOR RESTORATION IN THE MATOPIBA.....43**

LIST OF FIGURES

Figure 1. Map of Brazil with indication of biomes, where the Cerrado is represented in orange and the Matopiba region is highlighted in red..... 11

Figure 2. The Matopiba region..... 13

Figure 3. Use and conservation of the Matopiba soil..... 14

Figure 4. Protected areas in Matopiba..... 15

Figure 5. Deforestation rate in Matopiba in the last 20 years, with logarithmic trend line..... 16

Figure 6. Areas that were cleared in the last two decades (2001-2010 and 2011-2020) in the Matopiba states (in hectares)..... 17

Figure 7. APP deficit (image A), RL deficit (image B) and surplus native vegetation (image C) by municipality in Matopiba..... 21

Figura 8. Simplified scheme for representing the ecological restoration chain, agents and surrounding environment..... 22

Figure 9. Problem tree for implementing ecological restoration in the Matopiba states..... 24

Figure 10. Example of the normative pyramid and its hierarchical character, with the main Ordinary Laws on environmental preservation and recovery..... 27

Figure 11. Simplified scheme for legalizing rural properties under the New Forest Code..... 28

Figure 12. CAR and PRA implementation stages and status of Matopiba states, 2020..... 30

Figure 13. Stages for creating a public policy and the respective indicators for developing each one of them..... 35

Figure 14. Description of the nature of each initiative and the number of initiatives included in each one of them..... 36

Figure 15. Categories created according to ecological restoration stages and the pre-established action areas in this study (green boxes), and the number of initiatives classified in each category..... 37

LIST OF TABLES

Table 1. RL and APP deficit and surplus native vegetation in the Matopiba region, by state..... 20

Table 2. Survey of restoration policies and regulations in the Matopiba states..... 31

Table 3. Main restoration problems identified in the Matopiba states, suggestions for possible improvement actions, and reference initiatives..... 38

1

INTRODUCTION



In recent decades, technological advances in soil preparation, seeds and harvesting have caused an agricultural revolution in Brazil and taken the country to technological leadership in terms of harvesting soybeans and other crops. The agro-industrial advance expanded rapidly in the Cerrado biome's areas, including the Maranhão, Tocantins, Piauí and Bahia states. This region has already been named the “new Brazilian agricultural frontier” and is known as Matopiba, an acronym that comes from the first two letters of the states' names.

One of the most important positive impacts of agricultural expansion refers to the economic effects. However, without control measures, negative social impacts can occur regarding local communities, such as increased social inequality and negative environmental effects, such as loss of native vegetation, loss of biodiversity and degradation of Permanent Preservation Areas (APPs), especially on the banks of water bodies, harming the basins' sustainability. These negative environmental impacts can considerably reduce or even cancel positive economic effects in the medium and long term.

Ecological restoration on farms becomes an important foundation for deforestation-free and sustainable production chains. Compliance with the Forest Code is decisive for containing deforestation, which reached almost 500 thousand hectares (ha) in 2020 in Matopiba.

Matopiba has liabilities of approximately 364 thousand hectares of Permanent Preservation Areas (APP) and 1 million hectares of Legal Reserves (RL), which must be recovered in compliance with the Forest Code. A positive ecological restoration agenda, in addition to the environmental benefits, can also have important synergies with social inclusion and fighting poverty, another challenge for the region's states.

The soy supply chain can provide more direct socioeconomic benefits to the local population. One of the ways to do this is by inserting more products and services into this production chain that can generate work and income for the local population – and the ecological restoration service represents this, bringing not only environmental benefits, but also socioeconomic benefits.

This document is a summary of the complete study that can be found on the Agroicone website¹. The study aims to support the development of new public policies and projects for ecological restoration, presenting an overview of restoration in Matopiba with important information about the current situation in the region and its bottlenecks. A benchmarking of government initiatives on restoration is also presented, which can be used as good practice references for solving the identified problems and bottlenecks. These surveys were performed based on surveys, interviews and consultations with experts from public agencies, Non-Governmental Organizations (NGOs), associations, and private organizations that work with restoration.

¹ The QR Code for accessing the document is on the cover of this study and can be found on page 3.

The study illustrates how clarity and good regulations on recovering native vegetation in Brazil are still lacking for rural landowners to comply with their legal obligations. Existing regulations are not implemented and many of them are confusing, with different terms from one state to another, and no pre-established indicators, causing great legal uncertainty, which makes restoration on the ground difficult. On the other hand, there are also successful public policies that have been implemented in some of the country's regions and that can be used as references in proposing solutions. It is hoped that this study will contribute to the ecological restoration agenda in Brazil, sharing knowledge and experiences with policymakers and other interested parties in the topic.

The study is the result of the project “Public policies for restoring native vegetation in Matopiba” developed by Agroicone with the support of the Land Innovation Fund (LIF), and it aims to create public policies regarding restoration that facilitate project implementation by rural producers. Furthermore, the project seeks to develop a permanent learning and collaboration environment for policymakers in Matopiba, aiming to establish a basis for continuity of the actions developed in favor of restoration.

2

THE CERRADO AND
THE MATOPIBA
REGION



The Cerrado is the second largest biome in Brazil, second only to the Amazon. It continuously covers 11 states as well as the Federal Capital District, in addition to enclaves in 3 other states, and covers close to 203 million hectares, which represents approximately 24% of the Brazilian territory^{2,3,4}. The Brazilian Cerrado contains the world’s richest savanna and is one of the global biodiversity hotspots. However, at least 137 species of animals are threatened and approximately 20% of native and endemic species are no longer present in protected areas³.



Figure 1. Map of Brazil with indication of biomes, where the Cerrado is represented in orange and the Matopiba region is highlighted in red. Source: Agroicone - prepared in-house with MMA (2019)⁵ data.

2 Romero, M; Costa, K.; Carneiro Filho, A.; Oliveira, M.; Alves, I. “Cerrado: expansão da área de soja”. São Paulo: INPUT Brasil, 2018.7.

3 Ministério do Meio Ambiente (MMA). “O Bioma Cerrado”. Available at <https://antigo.mma.gov.br/biomas/cerrado.html>. Accessed on February 10, 2021.

4 Instituto Brasileiro de Geografia e Estatística. “Informações Territoriais - Mapa dos biomas brasileiros”. 2004. Available at <https://bit.ly/3ssGQEI>. Accessed on February 10, 2021.

5 Ministério do Meio Ambiente. “Dados biomas”. 2019. Available at <https://www.gov.br/mma/pt-br>. Accessed on February 9, 2021.

Expansion of the Brazilian agricultural frontier, which took place as of the 1970s, significantly advanced the Cerrado, making it the second most altered biome in Brazil due to human occupation, second only to the Atlantic Forest³. According to data published by the National Space Research Institute (INPE), in 2001–2020, 29 million hectares were deforested in the Cerrado⁶.

An important region that became well known for agricultural frontier expansion based on high productivity technologies was Matopiba. Changes in land use and land tenure were relevant to the expansion of agricultural activity. Annual crops, stimulated by new production technologies, including irrigation, replaced extensive and traditional native pastures in fields and savannah areas. Despite the lack of infrastructure, the characteristics of the soil, the favorable rainfall regime and, especially the price of land favored the advance of the agricultural frontier^{2,7,8,9}.

The Matopiba was delimited by the Territorial Intelligence Group (GITE) of the Brazilian Agricultural Research Corporation (Embrapa) considering agrarian, agricultural, infrastructure, socioeconomic and natural framework criteria, with one of the main criteria being the Cerrado's presence in the states. Delimitation aimed to provide technical and scientific support on governance and strategic territorial intelligence issues¹⁰ and, after that, it has been raised as a focus and a cutout for public and private policies.

Watersheds that are of great importance for the country's water supply are present in this territory. They include the Tocantins-Araguaia basin, which covers 42.1% of the region (30 million ha), the Parnaíba basin that covers 20.16% of the total area (14.7 million ha), the Western Northeast Atlantic extending across 19.61% of the region (14.3 million ha), and the São Francisco basin reaching 18.11% of Matopiba (14.3 million ha)¹⁰.

6 Instituto Nacional de Pesquisas Espaciais (INPE). Cerrado - OBT, INPE. "Monitoramento do desmatamento no cerrado brasileiro por satélite". [s.d]. Available at <http://bit.ly/3uBkYJ6>. Accessed on February 26, 2021.

7 Embrapa. "Desenvolvimento Territorial Estratégico para região do MATOPIBA - Parceria INCRA e Embrapa (MDA e MAPA)". GITE - Grupo de Inteligência Territorial Estratégica. Campinas: 2015. Available at <http://bit.ly/2NdrkqK>. Accessed on February 15, 2021.

8 Miranda, Evaristo Eduardo, Magalhães, Luciola Alvez; Carvalho, Carlos Alberto de. "Proposta de Delimitação Territorial do MATOPIBA". EMBRAPA, Nota Técnica nº 1, Campinas: 2014.

9 Miranda, Evaristo Eduardo. "MATOPIBA: Caracterização, agendas e agências". Versão 8.1, março de 2015. Available at <https://bit.ly/2NAV3k4>. Accessed on February 10, 2021.

10 Miranda, Evaristo Eduardo. "Caracterização territorial estratégica do MATOPIBA". Versão 2.3, Campinas: Fevereiro de 2015. Available at <https://bit.ly/3aSsGXA>. Accessed on February 10, 2021.

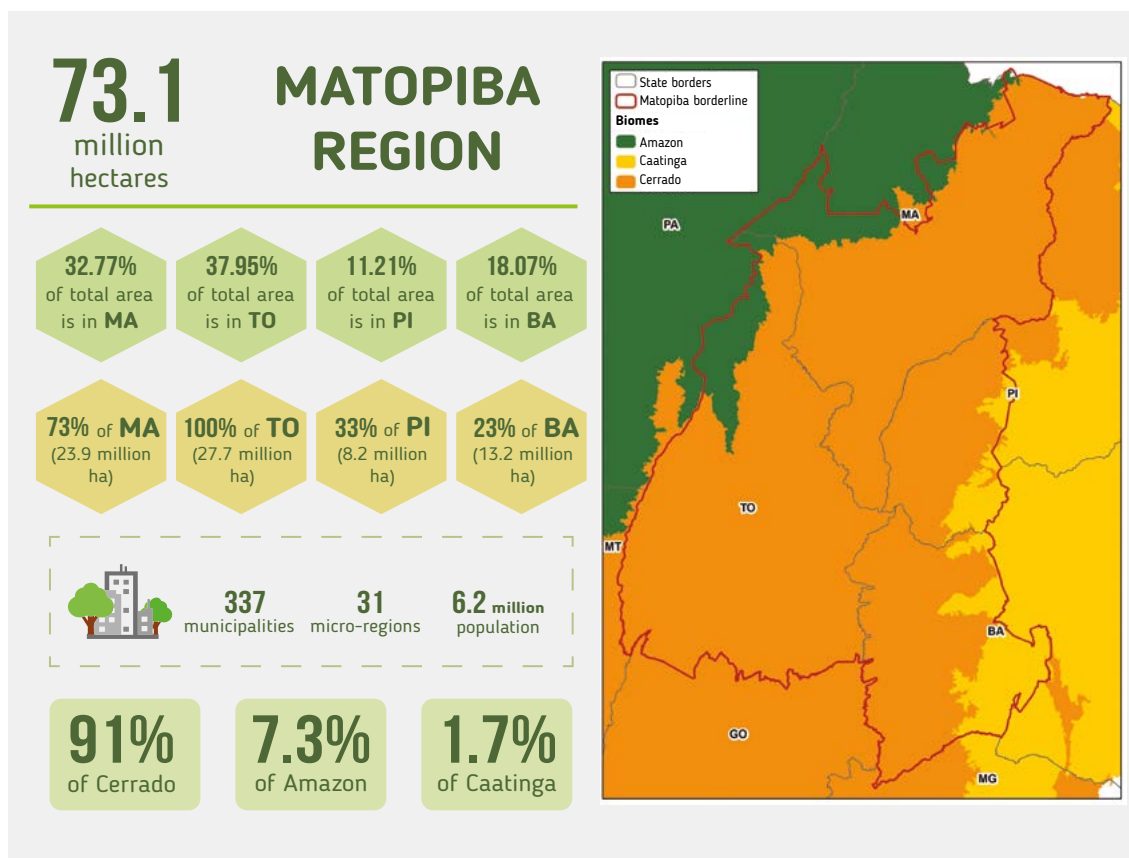


Figure 2. The Matopiba region. Source: Agroicone – prepared in-house with MMA (2019)⁵, Miranda (2015)¹⁰, MAPA (2020)¹¹, IPEA (2018)¹², IBGE (2020)¹³ data.

11 Ministério da Agricultura Pecuária e Abastecimento (MAPA). “Projeções do Agronegócio: Brasil 2019/2020 a 2029/30 – Projeções de Longo Prazo”. Secretaria de Política Agrícola, Brasília: 2020. Available at <http://bit.ly/3kkM6Y4>. Accessed on February 16, 2021.

12 Pereira, Caroline Nascimento; Castro, Cesar Nundes de; Porcionato, Gabriel Lanza. “Dinâmica Econômica, Infraestrutura e Logística no MATOPIBA”. Instituto de Pesquisa Econômica Aplicada (IPEA): Texto para discussão, Rio de Janeiro: 2018. Available at <https://bit.ly/2ZTtfd3>. Accessed on February 11, 2021.

13 Instituto Brasileiro de Geografia e Estatística (IBGE). “IBGE Cidades”. 2020. Available at <https://cidades.ibge.gov.br/brasil/panorama>. Accessed on February 23, 2021.

2.1 Soil use and conservation

According to MapBiomas - Coleção 5.0 de 2019 data, 51 million hectares were covered by natural forest and non-forest formations, representing 71% of the total area of Matopiba, and 20 million hectares were occupied by agriculture, equivalent to 27.5% of the region's total area¹⁴.

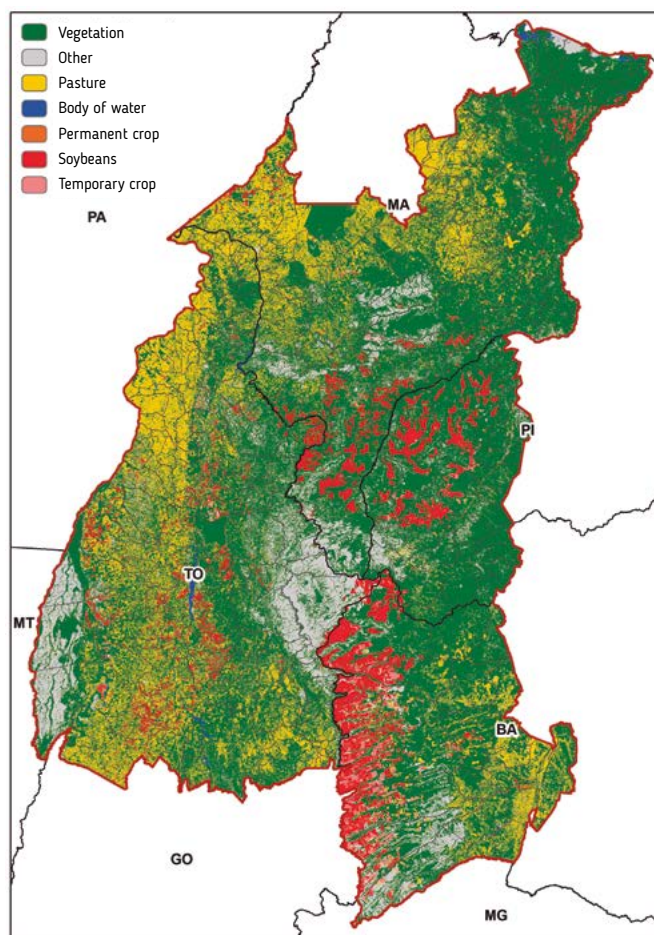


Figure 3. Use and conservation of the Matopiba soil.

Source: Agroicone - prepared in-house with MapBiomas data: Coleção 5.0 (2019)¹⁴.

Pasture is the most prevailing human use with 14 million hectares (19.6%), followed by soybean plantations with 4 million hectares (5.8%)¹⁴. According to the Image Processing and Geoprocessing

¹⁴ Projeto MapBiomas - Coleção 5.0 da Série Anual de Mapas de Cobertura e Uso de Solo do Brasil. "Uso e Cobertura Estado & Município (V2)". Accessed on February 22, 2021 on link: <https://plataforma.brasil.mapbiomas.org/>.

Laboratory (LAPIG)¹⁵, in 2017, 48% of the pasture area of the Matopiba consisted of degraded pasture (6 million hectares).

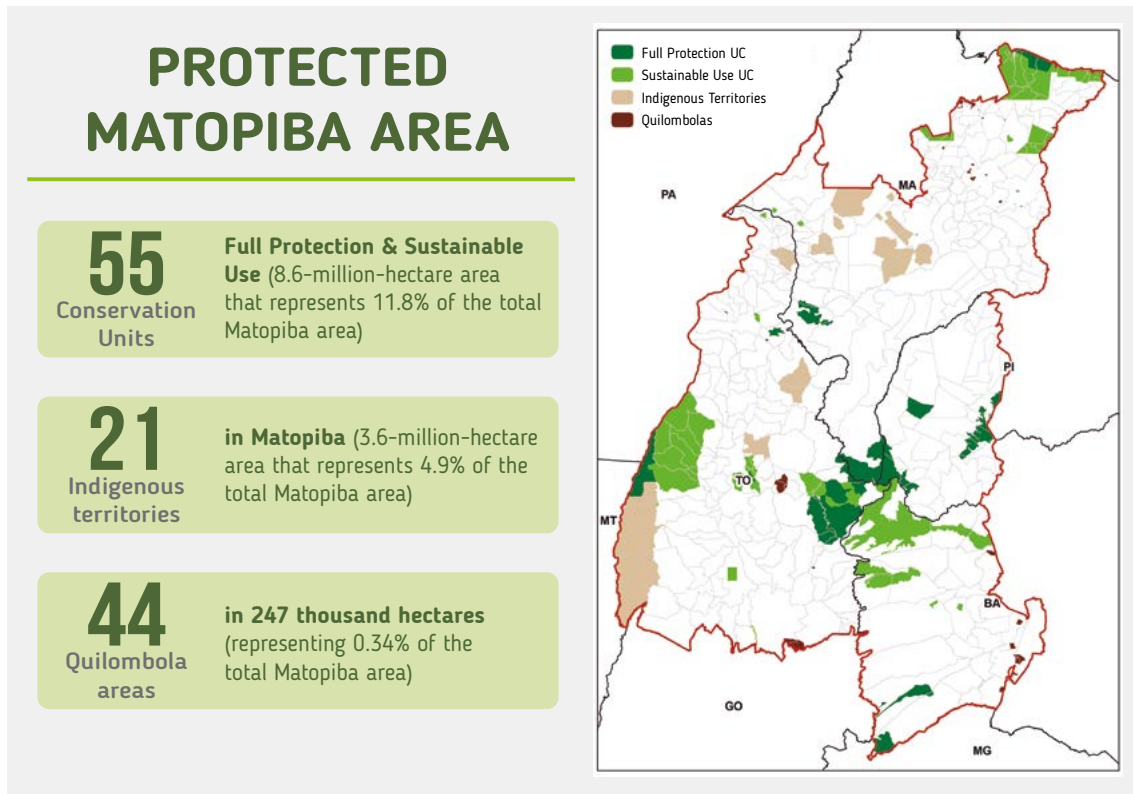


Figure 4. Protected areas in Matopiba. Source: Agroicone - Agroicone - prepared in-house with MMA (2020)¹⁶, FUNAI (2019)¹⁷, INCRA (2020)¹⁸ data.

Still regarding the agrarian situation in Matopiba, there are 1,053 settlements covering a 4.4 million hectare area (6% of the region’s total area), according to the National Colonization and Agrarian Reform Institute (INCRA). Based on data from the 2017 Agricultural Census of the Brazilian Geography and Statistics Institute (IBGE), there are 324 thousand agricultural establishments in Matopiba covering a 33 million hectare area, or 45% of the region¹⁹.

¹⁵ Laboratório de Processamento de Imagens e Georreferenciamento (LAPIG). “Atlas das pastagens brasileiras”. Available at <https://pastagem.org/map>. Accessed on February 10, 2021.

¹⁶ Ministério do Meio Ambiente (MMA). “Download de mapas geográficos”. 2020. Available at <http://mapas.mma.gov.br/i3geo/data-download.htm>. Accessed on February 9, 2021.

¹⁷ Fundação Nacional do Índio (FUNAI). “Terras indígenas”. [s.d]. Available at <http://www.funai.gov.br/index.php/shape>. Accessed on February 9, 2021.

¹⁸ Instituto Nacional de Colonização e Reforma Agrária (INCRA). “Quilombolas”. Ministério da Agricultura, Pecuária e Abastecimento (MAPA), Brasília: 2020. Available at <http://certificacao.incra.gov.br/>. Accessed on February 9, 2021.

¹⁹ Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Agropecuário de 2017: resultados consolidados. Rio de Janeiro: IBGE, 2019. Available at <http://bit.ly/2MrtFo8>. Accessed on February 9, 2021.

2.2 Deforestation

In 2001–2020, 13 million hectares were cleared in Matopiba⁶. This corresponds to 44.8% of the deforested area in the entire Cerrado area (29 million ha) in the same period.

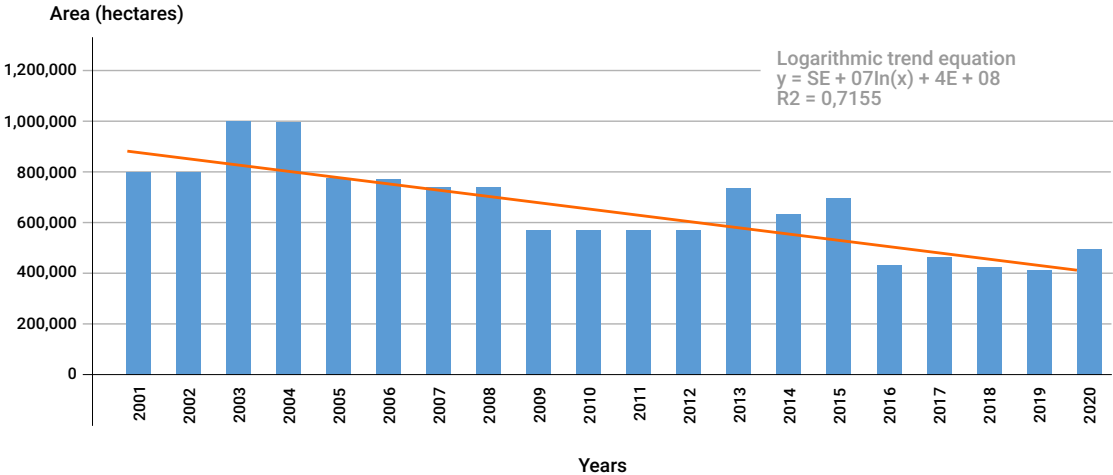


Figure 5. Deforestation rate in Matopiba in the last 20 years, with logarithmic trend line. Source: Agroicone - prepared in-house with INPE (2020)⁶ data.

It is noteworthy that a large part of this deforestation is legal and was authorized by environmental agencies, given that the legislation allows clearing 65% or 80% of the Cerrado area, whether it is outside or inside the Legal Amazon area, respectively. However, even though it is a legalized suppression of vegetation, such suppression also contributes to the general picture of loss of biodiversity and risk of ecological imbalance.

According to INPE data, the states that most contributed to the accumulated deforestation in Matopiba from 2001 to 2020 were Maranhão and Tocantins, with an increase in Tocantins’ share from 2011 to 2020 (Figure 6)⁶.

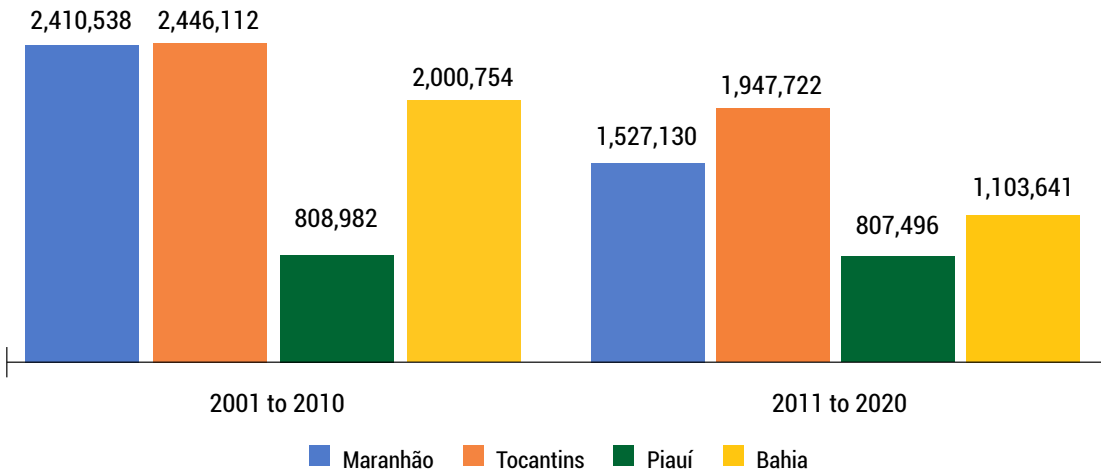


Figure 6. Areas that were cleared in the last two decades (2001–2010 and 2011–2020) in the Matopiba states (in hectares). Source: Agroicone - prepared in-house with INPE (2020)⁶ data.

Although 71% of Matopiba is covered by natural forest and non-forest formations, the region is one of the areas that are primarily responsible for loss of biodiversity in the Cerrado and, therefore, concern for environmental impacts of soybean expansion in the region has gained evidence.

2.3 Economic aspects

According to IBGE data, the Gross Domestic Product (GDP) in 2018 in the Matopiba region was R\$ 116 billion, corresponding to 1.7% of Brazilian GDP (R\$ 7 trillion). The per capita GDP in the same year in the Matopiba region was R\$ 18,029.35, about half of the Brazilian per capita GDP (R\$ 33,593.82), which indicates low local development in the region²⁰.

The agricultural sector directly influences the economy of the Matopiba region. Most of the municipalities with the largest number of areas planted with soybeans have the highest municipal GDP levels, including GDP and per capita GDP, which indicates the industry’s relevance in the region’s economic development. Despite this, there is criticism that there was no social development²¹ and there are impacts that still need to be better researched.

²⁰ Instituto Brasileiro de Geografia e Estatística (IBGE). “Produto Interno Bruto dos Municípios”. 2018. Available at <https://bit.ly/3knNqJV>. Accessed on February 23, 2021.

²¹ Russo Lopes, Gabriela & Bastos Lima, Mairon & Reis, Tiago. (2021). Revisitando o conceito de mau desenvolvimento: Inclusão e impactos sociais da expansão da soja no Cerrado do Matopiba. World Development. 139. 105316. Available at <https://bit.ly/3dNKvbU>. Accessed on February 26, 2021.

Concern for sustainable expansion of agriculture in the region is of paramount importance, considering that production in Matopiba tends to grow even more. For the region's biodiversity not to be severely harmed with increased grain production, it is extremely important that public policies are adopted to avoid conversion (deforestation) of new native vegetation areas as much as possible - fostering expansion of soybeans in areas that are already legally cleared; and leading cleared native forest areas to be recovered, focusing especially on those that have a legal obligation to recover them, such as Permanent Preservation Areas (APPs) and Legal Reserves (RLs).

3

ECOLOGICAL RESTORATION IN MATOPIBA



It is important that ecological restoration no longer be a problem for producers but be understood as the provision of important ecosystem services and as an opportunity for generating income to improve the quality of life of producers and surrounding communities. In this way, with greater engagement of people, the number of restored or conserved areas will increase, and contribute to conserving biodiversity.

From a legal point of view, priority areas should be those where there are environmental liabilities, such as APPs and RLs that have been deforested and degraded - especially APPs, as they cannot be compensated. The implementation of the Rural Environmental Registry (CAR) is a great ally for identifying these deficits in APPs and RLs and establish ways to restore and legalize such liabilities.

There is no doubt about how beneficial and relevant restoration is under an ecological standpoint, especially regarding ecosystem services such as soil, water source and biodiversity protection. Furthermore, the Cerrado serves to regulate the hydrological cycle, sustain the microclimate and capture and store carbon²².

According to estimates by Guidotti *et al.* (2017)²³, the amount of surplus native vegetation is much greater when compared to the deficits - almost 24 times greater than the RL deficit of 1 million hectares, totaling 24.1 million ha, which indicates the importance of compensation mechanisms. APP liabilities, areas that really need to be restored, total 364 thousand ha, with a broad leadership of Tocantins (183 thousand ha), followed by Maranhão (97 thousand ha) and Bahia (62 thousand ha), while in Piauí there is less than 21 thousand ha.

Table 1. RL and APP deficit and surplus native vegetation in the Matopiba region, by state.

State	Deficit in RL (ha)	Deficit in APP (ha)	Surplus Native Vegetation (ha)
Maranhão	416,869	97,218	7,385,553
Tocantins	418,514	183,302	7,448,770
Piauí	34,961	21,747	3,393,881
Bahia	159,496	62,085	5,908,545
Total	1,029,840	364,351	24,136,748

Source: Agroicone - prepared in-house with Guidotti *et al.* (2017)²³ data.

22 SEMA-DF, 2017. Plano Recupera Cerrado - Uma avaliação das oportunidades de recomposição para o Distrito Federal. 99p.

23 Guidotti, V. Freitas, F. L. M. Sparovek, G. Pinto, L. F. G. Hamamura, C. Carvalho, T. Cerignoni, F.(2017) Números Detalhados do Novo Código Florestal e suas Implicações para os PRAs. Sustentabilidade em debate, Número 5 - Piracicaba, SP: Imaflora. 10 p.

It is worth mentioning that these figures for deficits and surplus native vegetation are estimates from 2017, and for a more accurate number, validation data from the CAR or other analyzes are required. Furthermore, concentration of liabilities spatially matches the areas used for soybeans (Figure 7).

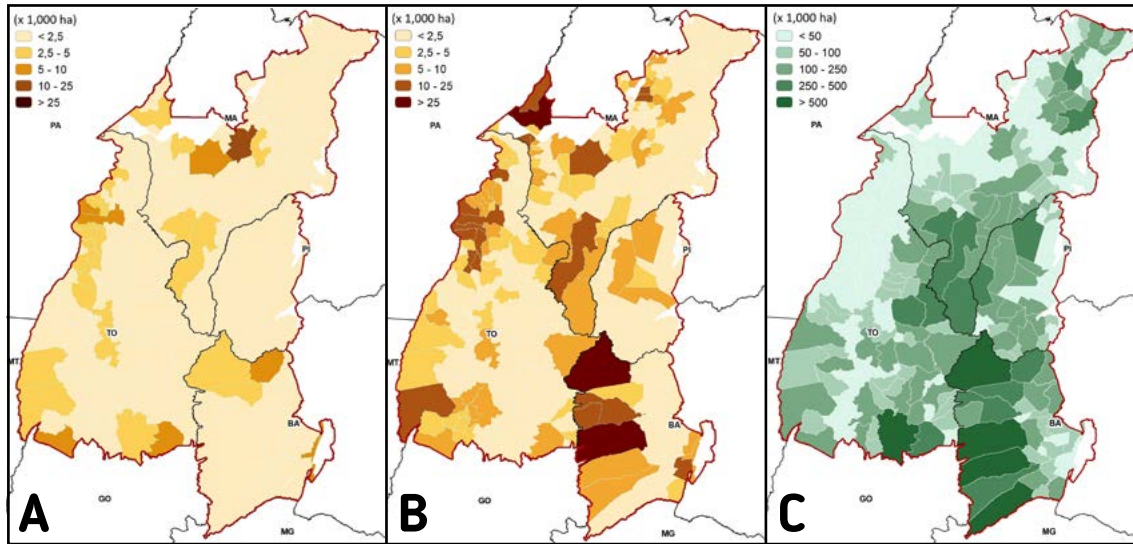


Figure 7. APP deficit (image A), RL deficit (image B) and surplus native vegetation (image C) by municipality in Matopiba. Source: Agroicone - prepared in-house with Guidotti *et al.* (2017)²³ data

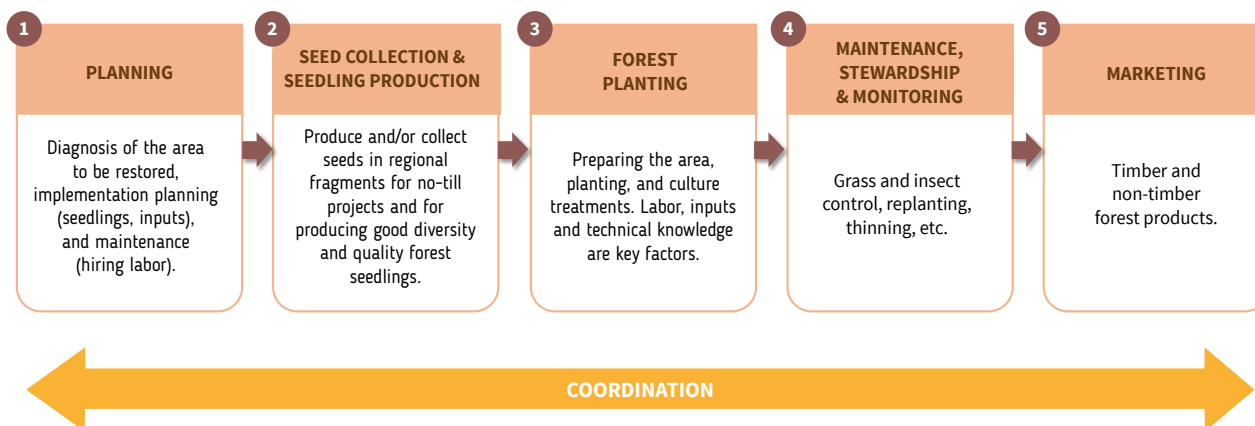
It is essential to understand what is now called the ecological restoration value chain, a term that considers the perspective of explaining and encouraging the economic importance of generated jobs and business. Assessing the restoration value chain also helps to find bottlenecks and ways to intervene.

There are the basic links in the chain, which are defined by the type of restoration activity, and the surrounding environment, with those steps that indirectly interfere in the chain. The basic ecological restoration chain consists of planning, seed collection and seedling production, planting, stewardship and monitoring, and marketing. Research & Development (R&D), regulatory bodies, other inputs, financing and markets are part of the surrounding environment. As in any analysis of value chains, coordination among the different agents is critical and can be developed and improved in different ways through specific organizations, such as associations and pre-competitive entities. Coordination can also be done by the agents/links in the chain (Figure 8).

AGENTS



STAGES



SURROUNDING ENVIRONMENT

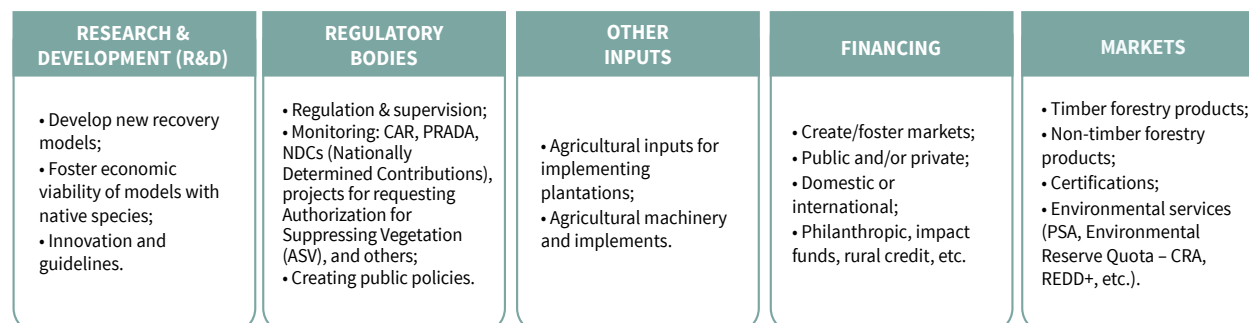


Figura 8. Simplified scheme for representing the ecological restoration chain, agents and surrounding environment. Source: Agroicone - prepared in-house.

The Cerrado has ecological particularities as it contains a diversity of non-forest ecosystems (technically also called phytophysiognomy), with vegetation that includes forest, savanna and grassland formations. Forests are areas with predominance of tree species. Savannas refer to areas with scattered trees and shrubs under grassy soil, without forming a continuous canopy. In grassland formations, herbaceous and shrub species predominate, with few trees in the landscape.

All the accumulated knowledge of ecological restoration developed by research organizations in the Southeast was designed for the Atlantic Forest for forming forests. Part of this knowledge was even based on exotic forestry, mixed with knowledge of the ecology of native forests – ecosystems of the Atlantic Forest and also of the Amazon. Thus, specific knowledge of Cerrado ecosystems is much more recent and is still being developed and disseminated.

In research & development (R&D) and training for restoring, producing and organizing knowledge on restoration of Cerrado ecosystems, and translating it into practical support material for restoration agents in practice, are important work fronts for boosting the chain. Consideration should also be given to adapting practices and methods made for other regions and ecosystems, in order to accelerate learning.

Direct seeding has emerged as an efficient method, especially for grassland and savannah vegetation, with several additional benefits, such as ease of deployment – and therefore with a significantly lower cost than for planting seedlings – and income generation for seed collectors. Consolidated restoration experiences with the direct seeding method exist in Goiás, Mato Grosso and Mato Grosso do Sul states, and there is great potential for expanding the use of the method in Matopiba.

There is currently no quantitative information regarding the size and extent of restoration in Matopiba, a problem that occurs across the country due to the fact that there is no source of data on restored areas or areas in the process of restoration. Some state environmental agencies have systems that come close to providing this information, but this is an exception. Therefore, this is a significant information gap that could be filled by public policy. Even without a source of precise information, it is known through information obtained informally from local actors that restoration in the Matopiba region is not as developed as in the Atlantic Forest or in the Midwest Cerrado.

The states have an important share in ongoing restoration projects and initiatives surveyed, especially Bahia and Tocantins. In Bahia, in addition to active participation of the State Environment Secretariat (SEMA) and the Environment and water resources institute (INEMA), the municipality of Luís Eduardo Magalhães also supports a restoration project, with a focus on APPs. Rural producer associations Bahia state farmers' and irrigants' association (AIBA) and the Irineu Alcides Bays foundation for supporting the Northern export corridor (FAPCEN), have restoration projects, as do some local NGOs (Lina Galvani institute, Água Doce association, Mundo Lindo foundation, Vida Cerrado park). The Federal University of Western Bahia (UFOB) serves as a Reference Center for Degraded Area Recovery (CRAD) for the Bahia Cerrado in partnership with AIBA, SEMA and São Francisco river valley and Parnaíba river valley development company (Codevasf). Some large and medium-sized international NGOs also work with restoration in Matopiba.

3.1 Difficulties for restoring the native vegetation

Based on interviews and workshops made with the Matopiba states' environmental secretariats, it was possible to identify problems and bottlenecks that each state faces for fostering ecological restoration.

In a summarized way, Figure 9 presents the problem tree for implementing ecological restoration in the Matopiba states.

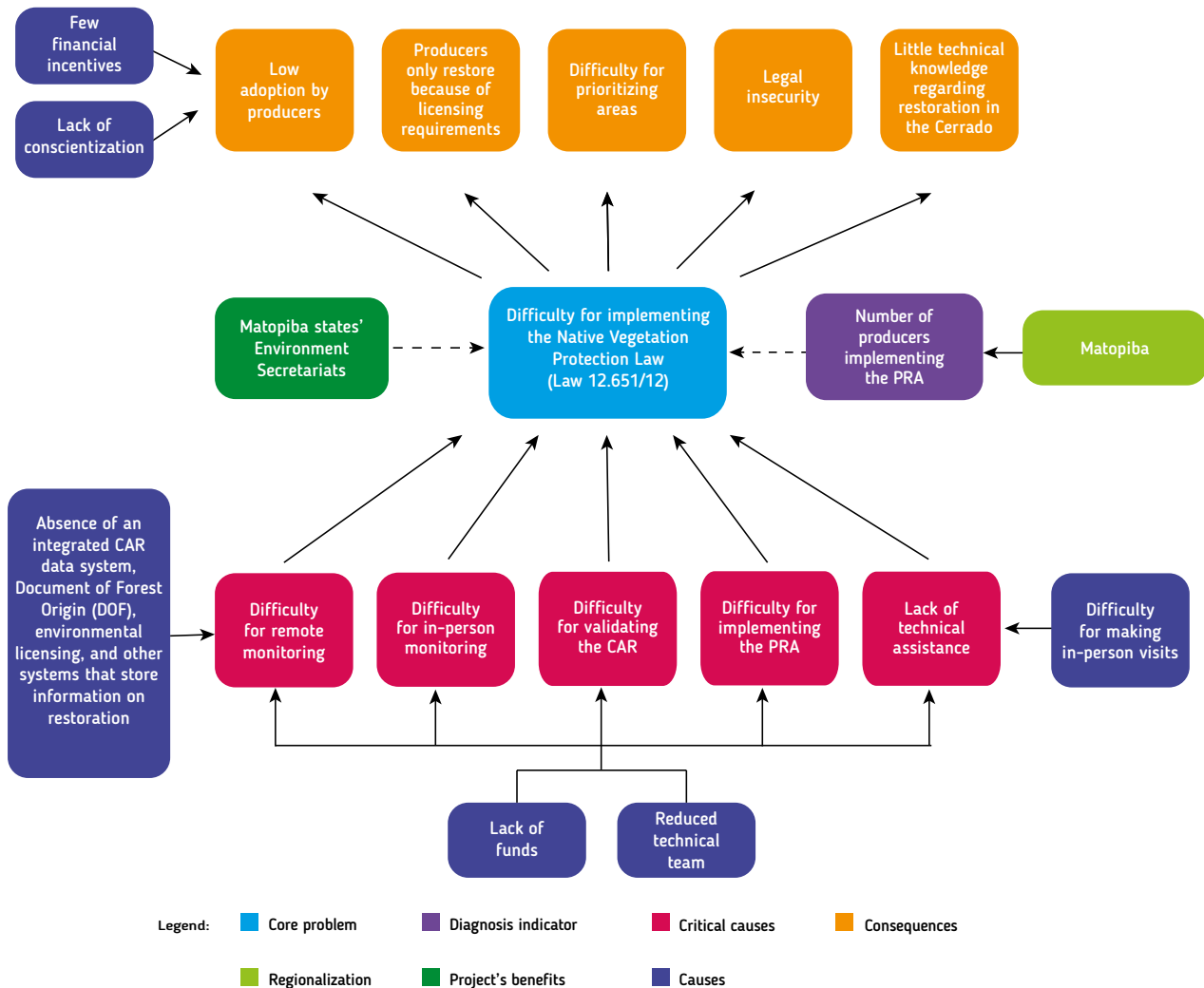


Figure 9. Problem tree for implementing ecological restoration in the Matopiba states. Source: Agroicone – prepared in-house.

One of the main challenges in restoration is the low demand for restoration and its adoption, which makes it difficult to advance the restoration chain, and has several repercussions. We can highlight little technical knowledge about native species, especially those that are typical of the Cerrado; on how to obtain economic benefit; in addition to absence of financial incentives or other economic counterparts. Implementing the New Forest Code is of great importance for generating demand for restoration and developing the restoration chain, but it continues to advance at a slow pace. In the environmental secretariats, the reduced number of technicians responsible for the large demand assigned to them ends up being a challenge for speeding restoration up.

These problems and bottlenecks affect different restoration stages: planning, implementing, monitoring and evaluating results, as well as financing and markets – these stages will be explained later in this report. Based on these bottlenecks, it is possible to identify successful initiatives deployed in Brazil to be used as references, in order to develop new actions for stimulating ecological restoration and environmental adequacy.

4

LEGAL ASPECTS THAT IMPACT RESTORATION IN BRAZIL AND IN THE MATOPIBA



There is a structure of types of laws, that is, legal system and normative types, which enables writing and establishing public policies according to the purpose to be achieved. Understanding this structure is important to avoid the risk of the policy not getting off the ground or generating lower-than-expected results.

The legal system consists of the set of laws of a country that are interrelated within an organized system. The first feature of this system is the hierarchy of norms, which became visually known as the “normative pyramid” and within it the norms are organized into “higher laws” and “lower laws”, the lower ones having to be in accordance with all those that are above.

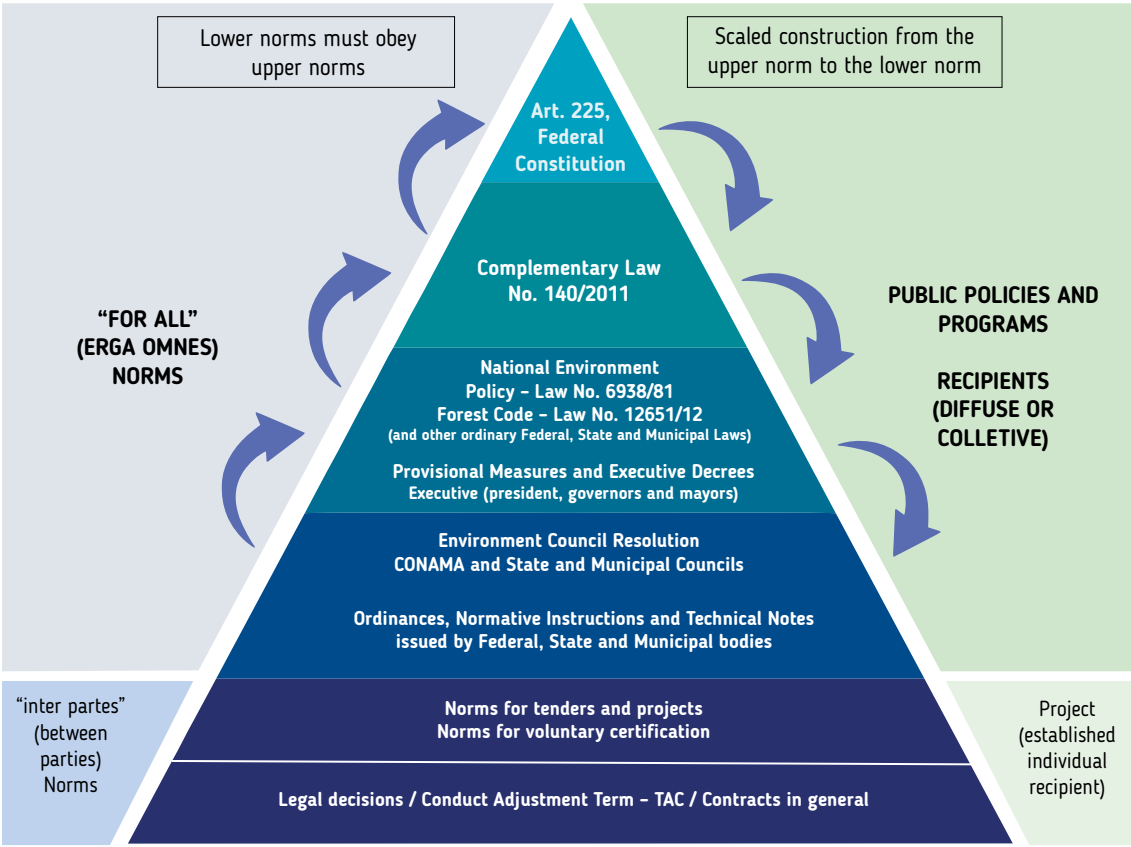


Figure 10. Example of the normative pyramid and its hierarchical character, with the main Ordinary Laws on environmental preservation and recovery.
Source: Agroicone – prepared in-house.

It must be explained that the federative entities (federal, state and municipal) are autonomous and can legislate freely in the matters they have competence in. However, each one's competence is set forth in the Federal Constitution, and there is need for the laws to obey the higher normative species. Thus, it is expected that state norms be in accordance with the federal ones, and municipal norms be in accordance with the ones of the state.

The Native Vegetation Protection Law - LPVN (Law 12.651/12), better known as the New Forest Code, which intends to preserve environmental balance, establishes both the obligation and the percentages of Legal Reserve (RL) areas for rural properties in its art. 12, as well as the so-called Permanent Preservation Areas (APPs), which must be preserved in both rural and urban areas.

The New Forest Code effectively brings instruments with the power to transform environmental recovery into reality, based on three pillars: the Rural Environmental Registry (CAR) of rural properties; the State Environmental Compliance Programs (PRAs), which will guide the adequacy process - where producers must submit the Project for Recovering Degraded or Altered Areas (PRADA); and the Terms of Commitment (TCs) that will encompass each producer's commitments²⁴.



Figure 11. Simplified scheme for legalizing rural properties under the New Forest Code. Source: Agroicone - prepared in-house with information extracted from Lima e Munhoz (2016)²⁴.

²⁴ Lima, Rodrigo C. A.; Munhoz, Leonardo. "Programas de regularização ambiental (PRAs) Um guia para orientar e impulsionar o processo de regulamentação dos PRAs nos estados brasileiros". Agroicone: INPUT Brasil; São Paulo: 2016.

Although the legislation is federal, it is up to the states to analyze and validate the CAR records and to regulate and implement the Environmental Compliance Program (PRA). However, after almost nine years of the enactment of the New Forest Code, most states are behind in its implementation, which makes the process even more difficult^{24,25}.

Delay in implementing the New Forest Code by the states generates legal uncertainty and causes a demand for restoration to be discouraged. Another relevant point to be noted is that, by making each state responsible for regulating its own PRA and other norms that interfere with restoration without technical guidelines (such as defining ecological indicators) and standardizing the terms used, confusion and uncertainties are generated in interpreting the legislation, which increases legal uncertainty. It is clear that a nationwide scope legislation needs to have the flexibility to allow adjustments according to each region's specificities. However, general guidelines could facilitate state regulation.

Still, some of the good regulations that exist in Brazil are not put into practice for a number of reasons, such as lack of resources for enforcement and lack of political support. Such legal uncertainty does not only bring problems regarding norms and regulations, but also affects the behavior of rural landowners, as it indicates that they can wait to carry out restoration, possibly because they will have more lenient rules or other type of support going forward.

Having broadly understood the main points and difficulties of the New Forest Code at federal level, it is important to analyze the situation of its implementation in the states that make up the Matopiba region. The Climate Policy Initiative (CPI) and the Land Use Initiative (INPUT), through the report "Where are we in implementing the Forest Code?", 2020 edition, defined steps for assessing the states' evolution regarding implementation of the law²⁵. These steps are presented in Figure 12.

²⁵ Chiavari, Joana; Cristina L. Lopes; Julia N. de Araujo. Onde Estamos na Implementação do Código Florestal? Radiografia do CAR e do PRA nos Estados Brasileiros. Edição 2020. Rio de Janeiro: Climate Policy Initiative, 2020.



Figure 12. CAR and PRA implementation stages and status of Matopiba states, 2020.
Source: Agroicone - prepared in-house with Climate Policy Initiative (2020)²⁵ data.

All Matopiba states have already reached the second stage, which is the analyzing and validating registrations. Bahia is the most advanced state and is in the last stage regarding deploying and monitoring APP and RL adequacy projects, that is, it has already gone through all the stages²⁵ despite necessary improvements in previous stages.

The Rural Environmental Registry (CAR), the Environmental Compliance Program (PRA) and the Ecological-Economic Zoning (ZEE) are specific policies and regulations for restoration. Other more technical standards of extreme importance for supporting and providing legal certainty for ecological restoration are ecological indicators (or other types of result indicators), restoration manuals (which indicate methodologies and step-by-step implementation), in addition to projects for defining theoretical or practical models with Demonstration Units (UDs) using different restoration techniques.

Although all states already have regulations that address the CAR, the PRA still requires attention. At the time this study was concluded, Bahia is the state that already has regulations in place related to the PRA; Tocantins has a draft law that will include the PRA; Piauí and Maranhão still need to advance in this regard.

The general Ecological-Economic Zoning (ZEE) is already regulated in almost all Matopiba states. They are working on preparing specific zoning for the biomes considered in each state, highlighting the Cerrado, which is the main target of this report.

Table 2 presents the survey of specific policies and regulations for restoration of each of the Matopiba states.

Table 2. Survey of restoration policies and regulations in the Matopiba states.

Specific Restoration Policies	
MA	<ul style="list-style-type: none"> • SEMA-MA Ordinance no. 13/2013: Environmental adequacy of agricultural and forestry activities. • State Law no. 10.276/2015: Establishes the Rural Property and Activity Environmental Compliance Program. • State Decree 32.361/2016: Attributes powers to the State Family Agriculture Secretariat (SAF) regarding CAR actions. • SEMA Ordinance no. 55/2017: Sets the procedures on CAR and on updating registration data in the National Rural Environmental Registration System - SICAR, within the scope of SEMA.

Specific Restoration Policies

MA	<ul style="list-style-type: none"> • Decree no. 33.662/2017: Creates the Committee for monitoring the CAR implementation process in Maranhão. • SEMA Ordinance no. 18/2020: Sets the procedures for analyzing and validating the CAR, referring to rural properties with more than 4 fiscal modules inserted in the SICAR. • Law no. 10.316/2015: Establishes Maranhão State's Ecological-Economic Macro-zoning (ZEE). • Law no. 11.269/2020 - Establishes ZEE for the Amazon Biome in Maranhão.
TO	<ul style="list-style-type: none"> • Naturatins Normative Instruction no. 04/2012: Establishes technical standards for the CAR. • COEMA Resolution no. 61/2015: Provides for the Registry of Rural Properties for Donation in Conservation Units (CIDUC). • Law no. 2.656/2012: Establishes Tocantins State ZEE.
PI	<ul style="list-style-type: none"> • Ordinary State Law no. 6.132/2011: Establishes the Environmental Compliance Program for Rural Properties in Piauí and creates the CAR. • Law no. 7193/2019: Provides for consumption of raw forestry materials and the compliance modes for mandatory forest replacement in Piauí. • Normative Instruction SEMAR no. 05/2020: Creates technical guidelines and procedures regarding the authorization of native vegetation suppression and other forest-related authorizations. • Decree no. 14.504/2011: Establishes the Inter-institutional Coordinating Commission for the Piauí ZEE - CICZEEPI.

Specific Restoration Policies	
BA	<ul style="list-style-type: none"> • Decree no. 15.180/2014: Regulates vegetation stewardship, native vegetation conservation, the State Rural Property Forestry Registry (CEFIR), and provides for the PRA for Rural Properties in Bahia. • Law no. 10.431/2006: Provides for Bahia State’s Environmental and Biodiversity Protection Policy. • Law no. 13.597/2016: Establishes PRA for Rural Properties. • Law no. 13.223/2015: Establishes the state policy for Payment for Environmental Services (PSA) and the State PSA Program. • Decree no. 18.140/2018: on authorization to suppress vegetation. • Decree no. 14.024/2012: on water resources. • Inema Ordinance no. 22.078/2021: Provides for approval of the location of RLs in Bahia State. • State Decree no. 14.530/2013: on implementing the Bahia ZEE.

Source: Agroicone - prepared in-house.

There are restoration manuals in Tocantins and Bahia and there is still room for improvement this point, especially with regard to regulating these manuals. Another subject that lacks actions and policies are models and Demonstration Units (UDs) for restoration, with a focus on learning the most assertive techniques for different area characteristics. Only Bahia has demonstration areas aimed at applied knowledge in restoration techniques.

5

**PUBLIC POLICIES
THAT MAKE
RESTORATION
ADVANCE IN BRAZIL**



5.1 Benchmarking for improving public policies

Considering the entire panorama of the current situation in the Matopiba region with regard to ecological restoration, including technical and legal aspects, a survey was performed of government initiatives for ecological restoration that can serve as references for developing new solutions to the problems and identified bottlenecks.

This way, this survey of initiatives was made through a benchmarking of ecological restoration policies – considering that benchmarking is the process of seeking and analyzing best practices for implementing them, with adaptations. Figure 13 summarizes the public policy design stages and the respective types of indicators used. According to Figure 13, preparing a benchmarking contributes to the public policy “agenda definition” and “formulation” stages, as it enables understanding the context in question and the problems involved, and also points out possible alternatives and innovative solutions inspired by existing initiatives, which is essential for advancing decision-making.

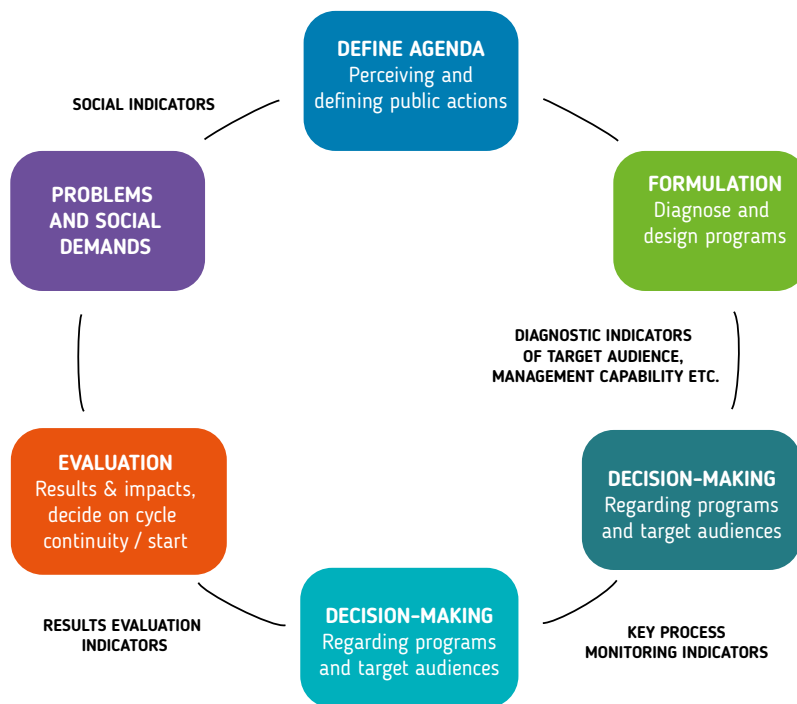


Figure 13. Stages for creating a public policy and the respective indicators for developing each one of them. Source: Jannuzzi (2017: 151)²⁶.

²⁶ Jannuzzi, Paulo de Martino. Indicadores Sociais no Brasil. Conceitos, fontes de dados e aplicações. 6 ed. São Paulo: Alínea, 2017.

It is noteworthy that the analysis of policies on restoration presented here is unprecedented and not exhaustive. In this study, all public policies raised in benchmarking were considered “initiatives”, ranging from comprehensive policies to specific projects and regulations. The collected information did not exist in a systematic manner and here they are presented and analyzed. It was not simple to gather the information and it was challenging to organize it in a way that collaborated with the country’s ecological restoration agenda. In addition, this study advanced in developing an analytical model, enabling more content to be compiled and the analysis to be expanded according to different usage objectives, as the information is dynamic and the analysis can be continuously improved. In any case, this benchmarking contributes significantly to supporting public policies for restoration in Brazil.

5.1.1 Initiatives raised

A survey was made of 58 ecological restoration-related initiatives deployed by public and private, national and international organizations in all Brazilian regions. In all, initiatives from 15 states (TO, PA, CE, PI, MA, BA, GO, MT, ES, SP, RJ, MG, PR, SC, RS) in addition to the Federal District were raised.

The initiatives raised are presented in an Excel file, in the spreadsheet named “Benchmarking de políticas públicas sobre restauração ecológica” (Benchmarking of public policies on ecological restoration)²⁷ available in portuguese on the Agroicone website. Elements regarding general information about the initiative, elements for analysis, areas of action and other information were added.

The types of initiatives were classified as Public Policy, Program or Project as detailed in Figure 14. 23 of the 58 initiatives refer to projects, 23 to programs and only 12 were classified as public policies.

PUBLIC POLICIES	PROGRAM	PROJECT
12 initiatives	23 initiatives	23 initiatives
<p>These are initiatives that are generally linked to the State based on society demands. It is a broader concept that in the administrative context can encompass a set of projects, programs and activities carried out by the government.</p>	<p>A set of projects or actions, managed in an integrated manner, so that they generate benefits that would not exist if the projects were not managed jointly.</p>	<p>Activities undertaken to achieve a specific objective. It is temporary and usually unique and exclusive. When the project’s objective is reached, it ceases to exist. As it is temporary, usually, after reaching the objective, the project work team is disbanded.</p>

Figure 14. Description of the nature of each initiative and the number of initiatives included in each one of them. Source: Agroicone – prepared in-house.

²⁷ The spreadsheet is part of the complete study available on the Agroicone website: Access to the document can be made through the QR code on page 3.

The initiatives were divided into 13 activity areas of - the number of initiatives in each area of activity is presented in parentheses and each initiative can include more than one activity area: environmental education (25), technical assistance for restoration (32), training technique for restoration (27), guide/manual of restoration techniques (15), priority area planning (22), monitoring recovered and conserved areas (28), creatin a fund (6), financing (19), Payment for Environmental Services - PSA (12), environmental tax (2), link with CAR (24), link with PRA - recovery of APP, RL restricted use areas (29), productive recovery - market access, e.g. SAF (29).

Regarding the elements of analysis, the initiatives raised were classified in 4 categories according to the stages of ecological restoration and the areas of action pre-established in this work, except for the area of environmental education, which is transversal in the restoration phases, as described below. Of the initiatives surveyed, in some cases, the same initiative encompasses more than one category, depending on the size, extent and investment of the initiatives.

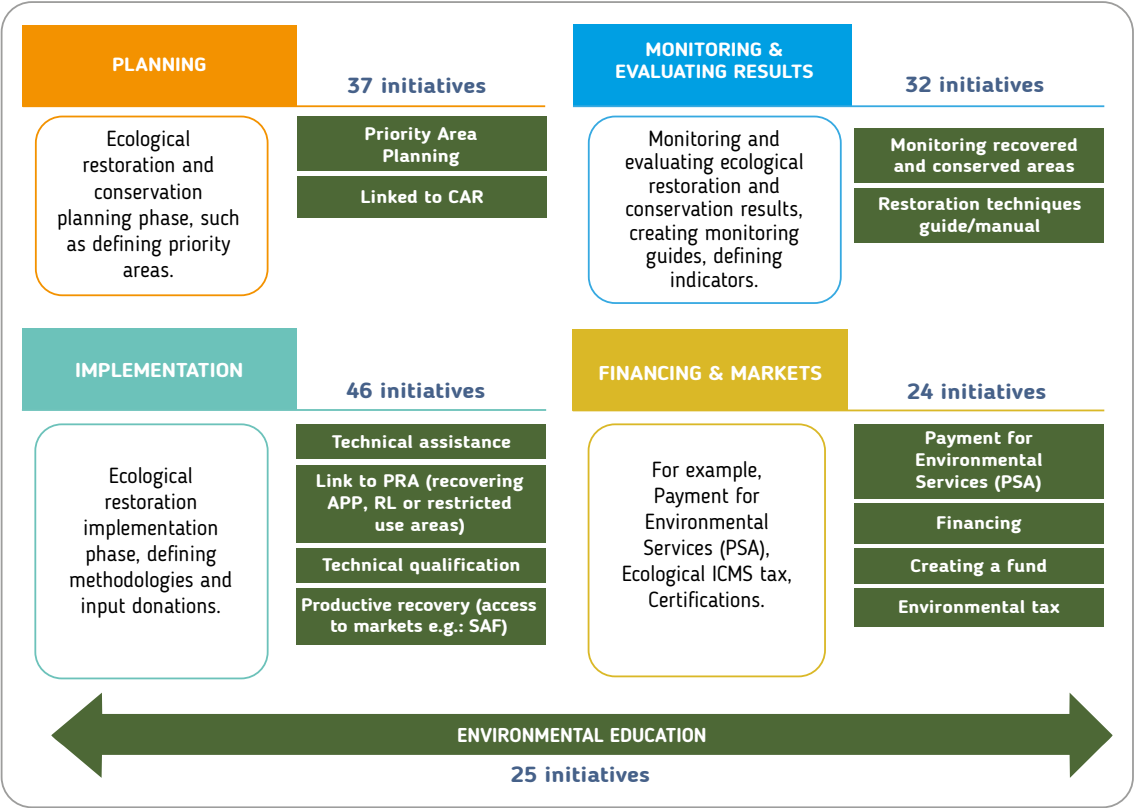


Figure 15. Categories created according to ecological restoration stages and the pre-established action areas in this study (green boxes), and the number of initiatives classified in each category. Source: Agroicone - prepared in-house.

5.1.2 Relevance and impact analysis

From the meetings held with each Matopiba state environmental secretariats, the main bottlenecks that hinder ecological restoration at scale in the region were identified. These bottlenecks were summarized in Table 3 along with possible improvement actions and initiatives raised in the benchmarking. This way, it is possible to select initiatives that are relevant to the states, that is, that respond to their current problems.

Table 3. Main restoration problems identified in the Matopiba states, suggestions for possible improvement actions, and reference initiatives.

Main identified problems	Possible improvement actions	Reference initiatives
Lack of monitoring mechanisms (integrated system, satellite images, own database)	Improvements in Information Technology (IT) issues: create an integrated system, satellite images, own database. This type of improvement can be interesting for offsetting decreases in the secretariats' technical teams	Programa Nascentes, Sistema Informatizado de Apoio à Restauração Ecológica (SARE), and Indicadores Ecológicos (SP)
Absence of regulation and PRA manual	Prepare manual and regulations for PRA and other development tools	PRA (MG)
Absence of technical assistance and regular monitoring	Regular technical visits (requires bigger teams in the governments or outsourcing), digital resources	Reflorestar (ES)
Absence of restoration projects for private properties	Contacts with owners to understand demands and possible incentives	Reflorestar (ES)

Main identified problems	Possible improvement actions	Reference initiatives
Lack of producer engagement and awareness of restoration	Understand demands and possible incentives for productive restoration	Reflorestar (ES) Conectando Florestas (SP/RJ)
Difficulty in analyzing and validating CAR	Contract or allocate a full-time technical team for exclusively analyzing and validating CAR	PCI (MT)
Lack of financial resources for restoration	External resources and fine compensation	Sistema Estadual de REDD+ e PCI (MT) Programa Nascentes (SP)

Source: Agroicone - prepared in-house.

In addition to relevance, considering the bottlenecks identified in the 4 states, it is also possible to perform an impact analysis of the raised initiatives in the benchmarking by choosing variables such as territorial scale, which indicates the jurisdiction (municipality, state, basin, etc.) or the number of hectares to which the initiative applies, as well as the scope, which indicates the number of activity areas to which the initiative applies. Impact analyzes require an in-depth analysis of the raised policies.

Two successful initiatives that stimulate, encourage and support ecological restoration are presented in the boxes below: Programa Nascentes (SP) and Estratégia Produzir, Conservar e Incluir - PCI (MT).

Programa Nascentes – São Paulo

The Nascentes (water sources) program involves the participation of different entities, including 12 São Paulo State secretariats of and other public bodies, private companies, civil society representatives, landowners, and restorers.

Investments are aimed especially at protecting and recovering riparian forest, spring and waterhole areas, but also working to increase native vegetation coverage in springs, in addition to planting native trees and improving production stewardship in watershed-forming basins²⁸.

Nascentes has three main instruments. One is the so-called *Project Shelf*, a list of ecological restoration initiatives approved by an Internal Commission. The list presents the defined restoration site and strategy that, in general, are proposed by NGOs and environmental sector companies. Another tool is the *Bank of Available Areas for Restoration*, which brings together APPs devoid of vegetation in public and private areas available for restoration. These locations were made available through a declaration made in the Rural Environmental Registry (CAR) or directly by the agency responsible for them. There are areas available in state Conservation Units (UCs) and agrarian reform settlements. As a result of the partnership between Nascentes program and the São Paulo State land institute foundation (ITESP), ecological restoration of 796.64 hectares has already been authorized²⁹. There is also the *Conversion of Fines into Environmental Services*, which allows administrative fines to be converted into environmental services through the program's restoration projects. In addition, the Nascentes program has a certificate and seal, enabling active brands to publicly associate themselves with the program.

The 20,000-hectare restoration target established for 2020 at the beginning of the program was exceeded, the figures for April 2021 indicate that there are currently 22,710 hectares under restoration being monitored by the program²⁹.

²⁸ São Paulo, Programa Nascentes; 2021. Available at: <https://www.infraestruturameioambiente.sp.gov.br/programanascentes> Accessed on June 14, 2021.

²⁹ São Paulo; 2020. Programa Nascentes bate meta com 20 mil hectares em restauração. Disponível em: <https://www.saopaulo.sp.gov.br/ultimas-noticias/programa-nascentes-bate-meta-com-20-mil-hectares-em-restauracao/>. Accessed on June 10, 2021.

Estratégia: Produzir, Conservar e Incluir (PCI) – Mato Grosso

The initiative aims to raise funds for Mato Grosso State for expanding and increasing efficiency in agricultural and forestry production, conservation of remnants of native vegetation, restoration of environmental liabilities, socioeconomic inclusion of family farming, and reducing emissions and sequestering carbon by controlling deforestation and developing a low-carbon economy³⁰.

Estratégia: Produzir, Conservar e Incluir (*Strategy: Produce, Conserve and Include* - PCI) initiative establishes a set of goals to help achieve its objectives. In the “Produce” axis, the following goals were set: recovering 2.5M ha of low-productivity pasture areas by 2030; increase productivity from 50 to 95 kgcw/ha/year by 2030; expand the grain area in degraded pasture areas from 9.5 to 12.5 million hectares by 2030; increase grain production from 50 to 92M ton by 2030; expand the area under sustainable forest stewardship from 2.8 to 6M ha by 2030; expand the area of planted forests in already cleared areas from 317,000 to 800,000 ha by 2030; and increase production of planted wood from 4.9M m³ to 11.75M m³ by 2030. In the “Conserve” axis, the goals were to maintain 60% of the native vegetation coverage in Mato Grosso State; reduce deforestation by 90% in the forest that is a reference for the 2001–2010 (PRODES) 5,714 km² baseline, reaching 571 km²/year by 2030; reduce deforestation in the cerrado by 95% based on the 3,016 km² (SEMA) baseline, reaching 150 km²/year by 2030; eliminate illegal deforestation by 2020; offset 1M ha of area subject to legal deforestation; register 90% of rural properties (CAR) by 2016; validate 100% of CARs by 2018; recompose 1M ha (100%) of degraded APPs by 2030; and reach environmental adequacy in 5.8M ha (100%) of Legal Reserves, with 1.9M ha for being recomposed by 2030. And the following goals were defined for the “Include” axis: expand the Technical Assistance and Rural Extension (ATER) services for family farming from 30% to 100% of families by 2030; increase the share of family farming in the domestic market from 20% to 70% by 2030; increase the share of family farming products in institutional markets from 15% to 30% by 2030; increase access to credit from R\$ 41 million to R\$ 1.3 billion/year by 2030; and deploy land tenure environmental adequacy in 70% of family farming lots by 2030³⁰.

³⁰ Estratégia PCI; 2021. Available at: <http://pci.mt.gov.br/>. Accessed on June 14, 2021.

The strategy emerged from a collective and participatory construction involving the public sector, the private sector, and the third sector. Aiming at implementing the strategy through Decree No. 468 of 31/03/2016, the State Committee for the *Strategy: Produce, Conserve and Include* (CEEPCI) initiative was created and its organizational structure was established. The CEEPCI is also a way for the Government to monitor the strategy³⁰.

The coordinating secretariats for each thematic axis are: the state's Chief of Staff Office, which is responsible for general coordination of the PCI Strategy; the State Secretariat for Economic Development (SEDEC), which operates in the "Produce" axis; the State Environment Secretariat (SEMA/MT), which operates in the "Conserve" axis; the State Family Agriculture Secretariat - SEAF, which works in the "Include" axis; and the State Planning and Management Secretariat (SEPLAG), which is responsible for planning³⁰.

In 2019, the PCI Strategy was restructured and a new phase began. Through Decree no. 46 of 27/02/2019, it was defined that implementing the strategy would take place in partnership with PCI institute, a private non-profit entity. This way, it was possible to offer Mato Grosso State a transparent and efficient instrument for public-private articulation and fundraising, and management in implementing programs and projects³⁰.

6

FINAL CONSIDERATIONS: BOTTLENECKS AND OPPORTUNITIES FOR RESTORATION IN THE MATOPIBA



Ecological restoration in Matopiba faces many problems that make it difficult, and often unfeasible, to perform it on a landscape scale. Restoration is a little-implemented activity due to numerous bottlenecks and high costs³¹.

One of these bottlenecks for ecological restoration in the country is due to misalignment and gaps in public policies, and especially to the delay in fully implementing the new Forest Code. To face this, clarifying the legislation and providing support to monitoring and inspection work are essential. This requires technical staff and other resources in environmental agencies, which are essential for environmental adequacy.

There are other bottlenecks in the ecological restoration chain, such as lack of engagement, low demand for restoration, low diversity and a small number of native seeds produced, as well as little dissemination of technical knowledge, lack of information on the silvicultural behavior of regional native species, poorly-skilled labor, lack of genetic improvement in native species with economic use, and absence of financial incentives or other economic counterparts geared to restoration³¹.

Strengthening the restoration production chain and implementing the New Forest Code are crucial factors for growth in the activity. For this, some actions need to be taken and encouraged with the help of different actors (government, producers, NGOs, cooperatives, technical consultancies, teaching and research institutions, and others), such as disseminating technical knowledge, incentives for producing seedlings and collecting seeds, encouraging cash-plantations, developing communication strategies for advancing the restoration sector, developing new credit lines and disseminating existing ones³¹.

In the Matopiba region, there are Permanent Preservation Area (APP) and Legal Reserve (RL) deficits and low-productive areas that can be used for recovering native vegetation. Recovering the 364 ha of APP is a good starting point for a comprehensive restoration program. The restoration chain that would be developed by this demand would even help to lower costs for restoration in other areas. If restoration is focused on APPs that are on soybean plantation properties, it would add even more focus of action, as it is a very small universe compared to all the properties and areas in Matopiba.

Analyzing public policies, especially benchmarking, was a very enriching exercise for understanding the situations in each Matopiba state's environmental secretariat and the good experiences in other states. Bottlenecks were also found at both federal and regional levels (Matopiba region) that make ecological restoration at scale difficult, which poses a challenge that new projects will have to address.

³¹ Antoniazzi, Laura; Sartorelli, Paolo; Costa, Karine; Basso, Iara. "Restauração florestal em cadeias agropecuárias para adequação ao código florestal: análise econômica de oito estados brasileiros". Agroicone: INPUT Brasil. São Paulo: 2016.

As already highlighted, this broad analysis of restoration policies has been a gap, so it is believed that the content presented here will be useful for several organizations that can use and contribute to this study, making benchmarking a dynamic tool when receiving new contributions.

It was found that major advances in public restoration policies were achieved through projects funded with external financial resources, such as the *Mata Ciliar de São Paulo* and *Paraná Biodiversidade projects*. These projects, in addition to concrete interventions in ground restoration, contributed to creating regulations and capacities in public bodies, leaving an important legacy. However, it indicates that public budget resources are not enough for working on the restoration agenda, even in the country's richest states.

This lack of budgetary resources for restoration indicates that the agenda has not been a priority for governments, but it can be compensated with private or mixed financial mechanisms, including international financial resources, given the importance of the topic globally. In this sense, alternatives such as those developed by Mato Grosso (PCI strategy) and Pará (Plano Estadual Amazônia Agora - PEAA) can bring important lessons for Matopiba.

Preserving vegetation in the region has a direct impact on water resources and, consequently, on agricultural production, in addition to being a legal obligation in the case of APPs. It therefore makes perfect sense for the productive sector to invest in the scale restoration agenda and, for this, supporting public policies is an essential part. A region in ecological imbalance is harmful to the well-being of the population and to local economic development, while pressure for sustainable production is growing. Matopiba states can and should significantly support the sustainable production agenda, including ecological restoration.

About Agroicone

Agroicone is an organization that generates knowledge and solutions to transform Brazilian agriculture towards the global challenges of sustainable development. It operates in five strategic areas: i) international trade and global issues; ii) sustainability and territorial intelligence; iii) public policies; iv) business, markets, financing; v) technologies in agro chains. Agroicone has a multidisciplinary team with broad expertise in the economic, regulatory/legal, territorial, socio-environmental and communication areas.

More information: www.agroicone.com.br

About the Land Innovation Fund

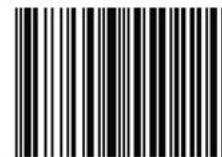
Initially funded by Cargill and managed by Chemonics International, the Land Innovation Fund supports initiatives that promote a sustainable soy supply chain, free from deforestation and from conversion of native vegetation, generating positive economic and socio-environmental impacts in three of South America's priority biomes: the Cerrado, the Gran Chaco and the Amazon.

The Fund supports innovations that bring higher yields through sustainable practices, mechanisms that motivate producers to conserve and restore native forests and vegetation, and initiatives that mobilize networks and resources to transform the soy supply chain.

More Information: <https://www.landinnovation.fund>

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