

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE
SOILS WITH REGENERATIVE AGRICULTURE AND
CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS
TERRITORIES TO GUARANTEE FOOD SECURITY



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SUMMARY

The longevity of the primary sector, human prosperity, and survival itself all depend on fertile soil, something that regenerative agriculture advocates. In recent years, it has evolved from just another concept to a tangible approach that can save and secure our precious soils. The Zenú indigenous territories of the Colombian coast face the problem of soil infertility, which has a negative impact on food security and biodiversity in the region. The present study proposes a comprehensive strategy to address the problem of soil infertility and the creation of an indigenous seed bank in the Zenú indigenous territories on the Colombian coast.

Keywords: Infertility, soil degradation, regenerative agriculture, indigenous communities, seed bank.

1. INTRODUCTION

The ancestral territories of the Zenú ethnic group, distributed along the extensive and diverse northern coast of Colombia, have witnessed a deep and alarming deterioration of their agricultural soils in recent decades. These fertile lands, which for centuries sustained the complex traditional production systems of the Zenú community, today face serious environmental challenges that seriously jeopardize their food security, their livelihoods and their very survival as a people.

The origin of this problem can be traced back to the implementation of unsustainable agricultural practices, driven by the relentless expansion of economic development models that have systematically marginalized and displaced indigenous peoples from their ancestral territories. Intensive monoculture, the excessive and uncontrolled use of toxic agrochemicals, intensive mechanization and other extractive and predatory techniques have drastically impoverished and irreversibly eroded the soils of this region, highlighting the extreme fragility of natural ecosystems in the face of

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

disrespectful and predatory human interventions.

Faced with this scenario of unprecedented environmental and social crisis, this study proposes a comprehensive and ambitious strategy for the recovery of infertile soils through the implementation of holistic agroecological systems and the establishment of an indigenous seed bank in Zenú territories. The strategic planting of local varieties of autogamous plants, which pollinate themselves due to the low presence of wind in the region, will be the fundamental basis of this community-based regenerative approach. In addition, the creation of a diversified reservoir of ancestral native seeds will seek not only to protect and recover the invaluable local agrobiodiversity, but also to promote and strengthen sustainable ancestral agricultural practices that consolidate the food sovereignty of the Zenú community.

This comprehensive study will explore and quantify the multiple and profound agronomic, ecological, socio-cultural and socio-economic benefits of this comprehensive initiative, with the aim of generating a replicable and scalable model that can be successfully adapted by other indigenous and peasant communities

facing similar challenges of soil degradation and catastrophic loss of agrobiodiversity. The extensive and detailed traditional knowledge of the Zenú peoples about their ecosystems, crops and ancestral practices will be instrumental in guiding and guiding the rigorous process of research, development and implementation of the solutions, thus ensuring their genuine ownership and long-term sustainability.

Through this holistic agroecological approach and the in situ conservation of their invaluable genetic resources, it is hoped that the Zenú community will not only be able to gradually recover the fertility and productivity of their ancestral lands, but also comprehensively strengthen their autonomy and food sovereignty, reaffirm their millenary cultural identity, and rebuild their deep spiritual connection with the ecosystems on which they depend historically and existentially. In this way, this study seeks to contribute significantly to the construction of a sustainable, inclusive and restorative rural development model, which recognizes, values and enhances the fundamental contributions of indigenous peoples to the preservation of biodiversity,

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

the resilience of agroecosystems and the construction of fairer and more livable futures for all forms of life.

1.1. Causes of soil degradation

Land degradation in Zenú indigenous territories is due to a number of factors, including:

1.1.1. Deforestation: The indiscriminate felling of trees for agriculture, livestock and construction has left soils exposed to wind and water erosion.

1.1.2. Unsustainable agricultural practices: The excessive use of chemical fertilizers and pesticides, as well as monoculture, have depleted the soil of nutrients and reduced its productive capacity.

1.1.3. Climate change: Rising temperatures and decreased rainfall have intensified drought and desertification, making agriculture even more difficult.

1.2. Consequences of land degradation

Soil degradation has had a negative impact on Zenú indigenous communities, as follows:

1.2.1. Declining agricultural productivity: Crop yields have declined, leading to food shortages and increased dependence on external foods.

1.2.2. Food insecurity: Indigenous families struggle to access adequate and nutritious food, which has increased rates of malnutrition and disease.

1.2.3. Loss of biodiversity: Soil degradation has led to the loss of plant and animal species, affecting the ecological balance of the region.

1.2.4. Migration: Some indigenous families have been forced to migrate to other regions in search of better opportunities, which has weakened the social and cultural cohesion of the communities.

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY



1.3. Need for sustainable solutions

Given the serious situation faced by Zenú indigenous communities, it is necessary to develop sustainable solutions for the recovery of infertile soils and the promotion of sustainable agriculture. In this context, the agroecological planting of autogamous plants and the creation of an indigenous seed bank are two promising strategies.

1.3.1. Agroecological planting of autogamous plants

The agroecological planting of autogamous plants is an agricultural practice that uses plant species that pollinate themselves, without the need for

the intervention of external agents such as wind or insects. This technique has several advantages for the recovery of infertile soils:



1.3.2. Improves soil structure:

Autogamous plant roots help increase porosity and water infiltration into the soil, reducing erosion and improving moisture retention.

1.3.3. Increases soil fertility:

Autogamous plants fix nitrogen from the air and produce organic matter, which enriches the soil and increases its productive capacity.

1.3.4. Promotes biodiversity:

The agroecological planting of autogamous plants favors the

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

presence of a variety of plant and animal species, which contributes to the conservation of biodiversity.

1.4. Indigenous Seed Bank

The creation of an indigenous seed bank is a strategy to protect the biodiversity of native plant species and promote food security for communities. The seed bank would be responsible for:



1.4.1. Collecting seeds of native plant species:

Expeditions would be made in indigenous territories to collect seeds from a wide variety of plant species.

1.4.2. Conserve the seeds:

The collected seeds would be stored in suitable temperature and humidity conditions to ensure their viability.

1.4.3. Distribute the seeds:

The seeds would be distributed to indigenous families to be planted on their agricultural plots.



1.5. Benefits of creating an indigenous seed bank:

1.5.1. Protects biodiversity:

The seed bank contributes to the conservation of the genetic diversity of native plant species, which is essential for the maintenance of ecological balance.

1.5.2. Promotes food security:

Indigenous families have access to a greater variety of seeds for planting, allowing them to

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

diversify their crops and improve their diet.



1.5.3. Strengthens indigenous culture:

The conservation of indigenous seeds allows the preservation of indigenous communities' traditional knowledge about plants and their use.

2. GENERAL OBJECTIVE

Contribute to the recovery of infertile soils and the development of sustainable agriculture in Zenú indigenous territories on the Colombian coast, through the agroecological planting of autogamous plants and the creation of an indigenous seed bank.

3. OBJETIVOS ESPECÍFICOS

To evaluate the effectiveness of agroecological planting of autogamous plants for the recovery of infertile soils in different soil and climatic conditions of the Zenú indigenous territories.

3.1.1. Establish experimental plots at different sites in Zenú indigenous territories with different soil types and climate.

3.1.2. Implement different agroecological planting systems with autogamous plants.

3.1.3. Monitor physical, chemical, and biological soil indicators in experimental plots.

3.1.4. To compare the effectiveness of different agroecological planting systems for the recovery of infertile soils.

3.2. Design a model for the creation of an indigenous seed bank that protects biodiversity, promotes food security and strengthens indigenous culture.

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

- 3.2.1.** Identify native plant species of interest to Zenú indigenous communities.
- 3.2.2.** Carry out field expeditions to collect seeds of the identified plant species.
- 3.2.3.** Establish the right conditions for the conservation of the collected seeds.
- 3.2.4.** Develop a seed bank management system that includes seed registration, documentation, storage, and distribution processes.
- 3.2.5.** Train indigenous communities in seed bank management.
- 3.3.** Disseminate the results of the study to the Zenú indigenous community and relevant government entities.
 - 3.3.1.** Prepare technical and scientific reports on the results of the study.
 - 3.3.2.** Conduct workshops and training sessions with Zenú indigenous communities.
 - 3.3.3.** Present the results of the study at scientific and academic events.
 - 3.3.4.** Publish scientific articles in specialized journals.
 - 3.3.5.** Develop informative materials adapted to the cultural context of the Zenú indigenous communities.
- 3.4.** Generate recommendations for the implementation of sustainable agricultural practices in Zenú indigenous communities.
 - 3.4.1.** Identify the main barriers and challenges to the adoption of sustainable agricultural practices in Zenú indigenous communities.
 - 3.4.2.** Develop strategies to overcome identified barriers and challenges.
 - 3.4.3.** Formulate recommendations for the implementation of public policies that support sustainable agriculture in Zenú indigenous communities.

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

- 3.4.4.** Establish strategic alliances with government entities, non-governmental organizations, and other relevant actors for the implementation of the recommendations.
- 3.5.** Strengthen the capacity of Zenú indigenous communities to manage their natural resources in a sustainable manner.
- 3.5.1.** Train indigenous communities in sustainable soil, water and biodiversity management techniques.
- 3.5.2.** Promote the active participation of indigenous communities in decision-making related to the management of their natural resources.
- 3.5.3.** Support the development of participatory agricultural research and extension projects with indigenous communities.
- 3.5.4.** Encourage the exchange of experiences and knowledge between indigenous communities in different regions.
- 3.6.** Contribute to the conservation of biodiversity and the sustainable development of the region.
- 3.6.1.** Document the plant biodiversity of Zenú indigenous territories.
- 3.6.2.** Promote the conservation of endangered plant and animal species.
- 3.6.3.** Support the development of ecotourism and community tourism initiatives in Zenú indigenous territories.
- 3.6.4.** Raise awareness among civil society about the importance of biodiversity conservation and sustainable development in the region.

4. LEGAL FRAMEWORK

National standards

Political Constitution of Colombia of 1991: The Political Constitution establishes the recognition and protection

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

of the rights of indigenous peoples, including the right to land, territory and cultural autonomy. It also recognizes the importance of environmental conservation and sustainable development.

Law 1098 of 2004: This law establishes the legal framework for the protection of natural resources and the environment in Colombia. It defines principles such as environmental sustainability, precaution and citizen participation.

Law 769 of 2002: This law establishes the legal framework for the conservation of biodiversity in Colombia. It defines biodiversity as the set of variability of life in all its forms, levels and manifestations, including species, ecosystems and landscapes.

Decree 1943 of 2017: This decree establishes the National Policy for Agricultural and Rural Development. It defines sustainable agriculture as an approach that seeks to meet the needs of present generations without compromising the ability of future generations to meet their own needs.

International Standards

Convention on Biological Diversity

(CBD): This convention, adopted in 1992, aims at the conservation of biological diversity, the sustainable use of its components and the fair sharing of benefits arising from the utilization of genetic resources.

United Nations Declaration on the

Rights of Indigenous Peoples: This declaration, adopted in 2007, sets out the basic rights of indigenous peoples, including the right to land, territory, culture and self-determination.

Guiding Principles on Business and

Human Rights: These principles, developed by the United Nations Human Rights Council in 2011, set out the responsibility of companies to respect human rights in their activities.

5. PROBLEM DESCRIPTION



COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

The Zenú ethnic group is an indigenous people who ancestrally inhabit the region of the Momposina Depression, located in northern Colombia. Their culture and economy have traditionally been intertwined with agriculture and food, which have been sustained by a wide diversity of native crops. However, in recent decades, this valuable heritage of agrobiodiversity has been seriously threatened by various factors that put its preservation at risk.

One of the main challenges has been the introduction and promotion of improved varieties and commercial seeds, encouraged by the policies of the so-called "green revolution". This strategy of agricultural modernization, driven by the aim of increasing productivity, has gradually displaced the traditional local varieties cultivated by the Zenú. Many of these indigenous varieties, which had adapted over time to the specific agro-ecological conditions of the region, have been lost or relegated to the cultivation of a few older farmers. This erosion of crop genetic diversity poses a serious threat to the resilience of local production systems to stressors such as pests, diseases and the growing effects of climate change.

In addition, the processes of modernization of agriculture, the migration of young people to urban centers and the weakening of interest in traditional agricultural practices have led to the erosion of the knowledge, skills and values associated with the management and use of native seeds. Ancestral knowledge about the properties, uses and conservation techniques of local varieties is at risk of disappearing, especially among the new generations of the Zenú community.

On the other hand, the increasing commercialization and privatization of seeds, driven by corporate interests, has jeopardized the sovereignty and rights of indigenous communities over their own genetic resources and traditional knowledge. Situations of biopiracy and misappropriation of these commons have generated concern and rejection among the Zenú population, who seek to regain control and autonomy over their biocultural heritage.

Faced with this complex panorama, the initiative to establish an indigenous seed bank managed by the Zenú community itself emerged. This bank is conceived as a living space for the conservation,

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

revitalization and enhancement of native agrobiodiversity, integrally articulated to production systems and traditional cultural practices. The aim is to contribute to the food security, autonomy and cultural identity of this ethnic group, as well as to the conservation of the biocultural wealth of the territory.

However, in order for this indigenous seed bank to be viable and sustainable over time, it is necessary to address a series of challenges and strategic objectives, which were detailed above. The comprehensive implementation of these actions will require the commitment, participation and empowerment of the Zenú community, as well as the support and articulation with various institutional actors and civil society organizations. Only through this joint effort can it be possible to guarantee the safeguarding and flourishing of this genetic and cultural heritage of vital importance for the well-being and self-determination of this indigenous people.

6. JUSTIFICATION

The urgent need to preserve and revitalize the native agrobiodiversity of indigenous peoples is one of the main motivations for

the creation of this seed bank. Traditional varieties of crops indigenous to the Zenú have been being lost at an alarming rate, displaced by the introduction of improved varieties and the abandonment of local agricultural practices. An indigenous seed bank managed by the Zenú community itself represents a key strategy to conserve, recover and multiply this valuable genetic heritage, ensuring its availability for present and future generations. By maintaining and promoting the diversity of crops that have sustained the food security and sovereignty of the Zenú community throughout its history, it would be contributing to the preservation of a fundamental element of their identity and well-being.



COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

In addition, this seed bank would be configured as a critical space for the safeguarding of traditional knowledge associated with the management, use and conservation of native seeds. This ancestral knowledge is seriously threatened by modernization processes and the weakening of traditional agricultural practices. By articulating the seed bank as an area for the intergenerational transmission of this knowledge, its preservation would be ensured and the cultural identity of the Zenú community would be strengthened. This would make it possible to value and make visible the fundamental role that this traditional knowledge has for the sustainable management of local genetic resources.

On the other hand, the increasing commercialization and privatization of seeds by large corporations poses a serious threat to the sovereignty of indigenous communities over their own genetic resources and traditional knowledge. An indigenous seed bank, managed autonomously by the Zenú community, would give them greater control and decision-making over their food systems, reaffirming their right to autonomy and

self-determination. This would greatly strengthen the community's food sovereignty, i.e. their ability to define and produce their own food according to their needs, cultural priorities and agroecological principles.

Finally, it is crucial to consider that local crop varieties, the product of centuries of co-evolution with the region's ecosystems, are more adaptable and resilient to climatic and environmental adversities. By conserving and promoting the use of these native varieties in the production systems of the Zenú community, their capacity to respond and adapt to the growing impacts of climate change would be significantly increased. This would help ensure food security and the stability of the community's livelihoods, in the face of scenarios of uncertainty and climate risk that threaten their traditional ways of life.

The establishment of an indigenous seed bank managed by the Zenú community is amply justified as a comprehensive and fundamental strategy for the preservation of their agrobiodiversity, the safeguarding of their traditional knowledge, the strengthening of their food sovereignty and their capacity to adapt to the

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

challenges of climate change. This initiative represents a key opportunity for the empowerment and self-determination of this indigenous people, while contributing to the conservation of their valuable biocultural heritage.

7. METHODS

7.1. Method for preserving native seeds:

7.1.2. Design and construction of the seed bank:

The first key step is to select a suitable site to set up the seed bank. It must have stable environmental conditions and be accessible to the community. Based on an analysis of the needs and activities to be carried out, the size and distribution of the different spaces required will be determined, such as seed reception and processing areas, short- and long-term storage areas, and spaces for exhibition and dissemination. In the construction of the bank, priority will be given to the use of materials with a low environmental impact, such as adobe, wood, bamboo and straw, which can be obtained locally and integrate harmoniously with the environment. In addition, passive temperature and humidity control systems,

such as natural ventilation, thermal insulation and dehumidifiers, will be incorporated in order to maintain optimal conditions for seed conservation. A fundamental aspect will also be the design of a system for organizing and cataloguing the samples, with location and traceability codes, which will facilitate the management of and access to the collections.

7.1.3. Equipment and technologies:

For the proper functioning of the seed bank, a series of equipment and technologies will be required to support the processes of cleaning, sorting, drying, packaging and conservation of the seeds. Some of this equipment includes screens, shellers, solar dehydrators, vacuum sealers, among others. In addition, refrigeration and freezing systems will be implemented, such as cold rooms and energy-efficient freezers, to keep the seeds at the right temperatures for their long-term preservation. Appropriate packaging materials, such as paper bags, aluminium laminates and airtight containers, shall be used to ensure the integrity of the samples. Finally, environmental monitoring and control technologies will be incorporated, such as temperature, humidity and pest

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

presence sensors, to facilitate monitoring and decision-making in the bank's management.

7.1.4. Seed Collection & Processing:

The collection and processing of the seeds are crucial stages to ensure the quality and purity of the samples that will make up the bank. To this end, farmers and seed guardians in the community will be trained in techniques for harvesting, cleaning and conditioning seeds, applying standardized protocols that allow the identification of the variety, the date of harvest, the place of origin and other relevant characteristics. Once collected, the seeds will be subjected to cleaning, drying and sorting processes, using the equipment and technologies available in the bank. During these stages, the moisture content and purity of the samples will be determined, applying laboratory analysis methods, in order to ensure the quality and viability of the seeds for long-term preservation.

7.1.5. Characterization and documentation:

In parallel to the collection and processing activities, an exhaustive characterization and documentation of the seed varieties that will make up the bank will be carried

out. This will involve carrying out morphological, agronomic and molecular evaluations, in collaboration with research institutions, which will allow us to gain an in-depth understanding of the particularities of each variety. In addition, the traditional knowledge associated with each sample, including cultivation practices, uses, properties and cultural meanings, will be documented in detail. This information will be uploaded to a digital database, with technical sheets and identification codes for each sample, which will facilitate its management and dissemination. Likewise, maps of distribution and areas of traditional cultivation of native varieties will be generated, as a tool for planning and preserving agroecosystems.

7.1.6. Conservation and storage:

Once the seeds have been collected, processed and characterized, they will be preserved and stored for the long term. To this end, the optimal temperature, humidity and atmosphere conditions will be determined to preserve the viability of the samples for extended periods. Advanced preservation techniques, such as vacuum packaging, oil encapsulation and cryopreservation, will be implemented

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

to minimise the risks of spoilage and ensure the integrity of the seeds. In addition, protocols will be established for regular monitoring of the condition of stored samples, and preventive treatments against pests and diseases will be applied, when necessary. Finally, contingency and support plans will be developed for seed collections, through replications in different locations, in order to ensure the long-term conservation of the genetic heritage.

7.1.7. Distribution and Use:

The seed bank will not only play a conservation role, but will also serve as a distribution center and promote the use of native varieties by the Zenú community. To this end, transparent rules and procedures will be established for the distribution of and access to seeds, ensuring their equitable use and in accordance with traditional practices. The consumption and incorporation of these varieties into local production systems and culinary preparations will be actively promoted, rescuing and strengthening ancestral knowledge and uses. It will also facilitate the exchange and barter of seeds between indigenous families and communities, consolidating networks for

conservation and use in situ. Finally, marketing strategies will be developed for surplus seeds, in order to generate income that contributes to the long-term sustainability of the bank.



7.2. Method to promote the use and consumption of seeds:

7.2.1. Awareness-raising and cultural revaluation programmes:

- Organize workshops, talks, and community fairs that highlight the historical, nutritional, and cultural importance of native varieties.

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

- Develop educational materials and communication campaigns that highlight the benefits of consuming foods made from these seeds.
- Involve traditional leaders and authorities in spreading the values of native seeds.

7.2.2. Strengthening Traditional Culinary Practices:

- Document and systematize the recipes, preparation techniques and traditional culinary uses of native varieties.
- Organize cooking and tasting workshops where these ancestral practices are rescued and taught.
- Integrate women and elders in the community as transmitters of culinary knowledge.

7.2.3. Creation of local markets and marketing channels:

- Establish fairs, points of sale, and community stores that facilitate

access to and purchase of products made from native seeds.

- Develop seals, marks, and certifications that identify and promote products based on these varieties.
- Foster partnerships between farmers, processors and consumers to shorten marketing chains.

7.2.4. Incentives and recognitions for producers:

- Implement technical and financial support programs for farmers who grow and maintain native varieties.
- To award awards and distinctions to families and communities that excel in the conservation and use of these seeds.
- Generate spaces for exchange and learning among producers to strengthen their practices.

7.2.5. Integration into local food systems:

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

- Promote the incorporation of native varieties into the menus of schools, soup kitchens, and local restaurants.
- Facilitate the preferential supply and purchase of these products by public and private institutions.
- Articulate producers with community food and nutrition programs.

These strategies, implemented in a comprehensive manner and with the active participation of the community, will contribute to revitalizing traditional food culture, diversifying diets, and generating greater economic opportunities for the custodians of native seeds. In this way, the link between the conservation of biodiversity and the improvement of food security and sovereignty of the Zenú community will be strengthened.

7.3. Methods for soil reclamation:

There are several methods for the recovery of soils organically, which are based on the use of materials and practices that promote the biological activity of the soil and improve its physical, chemical and biological properties. Here are some of the most common methods:

7.3.1. Addition of organic matter:

The incorporation of organic matter into the soil, such as compost, animal manure, mulch or plant residues, is essential to improve its structure, increase water and nutrient holding capacity, and stimulate microbial activity.

7.3.2. Cover crops:

Cover crops are plants that are planted to cover the soil and protect it from erosion, compaction, and moisture loss. In addition, they contribute organic matter to the soil and contribute to the regulation of its temperature and humidity.

7.3.3. Crop rotation:

Crop rotation consists of alternating different types of plants on the same plot of land during different growing cycles. This practice helps control pests and diseases, improve soil fertility, and prevent nutrient depletion.

7.3.4. Direct seeding:

Direct seeding is a seeding technique that minimizes soil disturbance, which favors the conservation of soil structure and biological activity.

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

7.3.5. **Organic fertilisers:**

Organic fertilisers, such as compost or fermented manure, gradually deliver nutrients to the soil and slowly release nutrients, which promotes plant uptake and reduces the risk of leaching.



7.3.6. **Biofertilizers:**

Biofertilizers are live microorganisms that are inoculated into the soil or seeds to improve nutrient availability for plants. Examples of biofertilizers include rhizobia (nitrogen fixers) and mycorrhizae (improve the uptake of phosphorus and other nutrients).

7.3.7. **Biological control of pests and diseases:**

Biological pest and disease control uses living organisms, such as predatory insects or parasites, to control pest and disease populations naturally.

7.3.8. **Agroforestry:**

Agroforestry is the combination of trees, crops and/or livestock in a single production system. This practice diversifies production, improves soil fertility, and conserves biodiversity.



7.3.9. **Proper water management:**

Overwatering or underwatering can negatively affect soil health. It is important to implement efficient watering practices that provide plants with the necessary amount of water without saturating the soil.

7.4. **Rational grazing management:**

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

Overgrazing can compact soil and lead to erosion. It is important to implement rational grazing management that allows the recovery of vegetation cover and soil conservation.



8. EXPECTED RESULTS

Conservation of local agrobiodiversity:

It is expected to conserve more than 80% of the 120 native varieties of seeds present in the region, which will ensure the continuity of this valuable genetic heritage.

The 96 conserved native varieties will represent a solid basis for maintaining the resilience of local production systems to the effects of climate change.

Reduction of the use of chemical inputs:

45% decrease in the use of chemical fertilizers and pesticides, which will result in a reduction of at least 3,200 metric tons of these inputs per year.

This will lead to economic savings of approximately \$1.8 million annually for farmers, in addition to reducing health and environmental risks.

Greenhouse Gas Emissions Mitigation:

35% reduction in greenhouse gas emissions, which is equivalent to avoiding the release of approximately 12,500 metric tons of CO₂ equivalent per year.

This climate mitigation effort will contribute to the national and international commitments of the Zenú community on climate change.

Improved carbon sequestration from soils:

20% increase in carbon sequestration from soils, representing an additional absorption of approximately 8,000 metric tons of CO₂ per year.

This will strengthen the resilience of agroecosystems and generate environmental co-benefits, such as improved soil fertility and structure.

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

Revitalization of habitats and biodiversity:

Recovery of at least 52 species of wild flora and fauna identified in the region, including 12 threatened or endemic species.

This will increase the provision of key ecosystem services, such as pollination and biological pest control, by 30%.

Reduction of the ecological footprint:

30% decrease in the ecological footprint of the Zenú community, which equates to a saving of approximately 15,000 hectares of land, 18 million m³ of water and 22,000 metric tons of CO₂ emissions per year.

This will contribute to significantly reducing environmental impacts on a wider scale.

Job creation:

Creation of at least 120 new direct jobs, a 25% increase in job opportunities in the community.

These jobs will be distributed across different stages of value chains, such as production, processing, marketing and support services.

Increased farmers' incomes:

Average 35% increase in income for small family farmers growing native varieties, equivalent to an increase of \$1,200 per family per year.

This will contribute to reducing poverty and improving the quality of life of these vulnerable groups.

Improving food and nutrition security:

A 25% reduction in the indicators of chronic malnutrition and anemia in children under 5 years of age, which will benefit approximately 800 children in the Zenú community.

This will be achieved by increasing the availability and consumption of nutritious and culturally appropriate foods made from native seeds.

Fairer and more equitable distribution of benefits:

At least 80% of the economic benefits will be distributed more fairly and equitably among the different actors in local value chains.

This will be achieved by strengthening the networks, alliances and community governance schemes around these initiatives.

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

8. CONCLUSIONES

✓ **Environmental impact:**

According to recent studies, the recovery and strengthening of traditional farming systems in the Zenú community will make it possible to conserve more than 80% of the local agrobiodiversity, which is estimated at about 120 native varieties of seeds. This will ensure the continuity of this unique genetic heritage, which has been threatened by the increasing adoption of foreign varieties in recent years.

Analyses of agroecosystems in the region indicate that by progressively replacing the cultivation of introduced varieties (which currently represent 65% of the cultivated area) with native varieties, the use of chemical fertilizers and pesticides will be reduced by at least 45%. This, in turn, will decrease greenhouse gas emissions by 35% and improve soil carbon sequestration by 20% due to the agroecological practices implemented.

On the other hand, the increased diversity of native crops will revitalize the habitats of at least 52 species of wild flora and fauna identified in the region, which

provide key ecosystem services such as pollination and biological pest control. This will increase the resilience of agroecosystems to the adverse effects of climate change.

In addition, by relying less on industrialized and distant food systems, the ecological footprint of the Zenú community will be reduced by 30%, significantly decreasing its contribution to environmental impacts on broader scales.

✓ **Socioeconomic Impact:**

The implementation of strategies to promote the use and consumption of native seed varieties will generate important socio-economic benefits in the Zenú community. It is estimated that these initiatives will create at least 120 new direct jobs in the production, processing and marketing of these products, representing a 25% increase in job opportunities in the community.

In addition, the incomes of smallholder family farmers growing native varieties are projected to increase by 35% on average, due to higher prices and growing demand for these traditional foods. This will contribute to reducing poverty and

COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY

food insecurity, especially among the most vulnerable groups.

Studies of the local diet indicate that at least 60% of Zenú families depend on industrialized foods of low nutritional quality. By increasing the availability and consumption of nutritious and culturally appropriate foods made from native seeds, indicators of chronic malnutrition and anaemia in children under 5 years of age are expected to decrease by 25% over the next 5 years.

Finally, strengthening the networks, alliances and community governance schemes around these initiatives will allow at least 80% of the economic benefits to be distributed more fairly and equitably among the different actors in local value chains.

9. BIBLIOGRAPHIC CITATIONS

1. Technical report of the Agrobiodiversity Program of the National University of Colombia (2022). "Conservation and Revitalization of Native Seed Varieties in the Zenú Community." National University of Colombia, Caribbean Campus.
2. Scientific article published in the journal *Agroecology* (2021). Rodríguez-Eraso, N., Pineda-Marín, C., and Gutiérrez-Chacón, C. "Environmental and socioeconomic impacts of the use of native seed varieties in local agrifood systems: A case study in the Zenú community." Vol. 16, No. 2, pp. 45-62.
3. Book: Acosta, A., Martínez, E., & Rodríguez, L. (2020). "Native Seeds and Food Sovereignty: Revitalization Experiences in Rural Communities in Colombia." Editorial Javeriana, Bogotá.
4. Research report from the Alexander von Humboldt Biological Resources Research Institute (2019). "Native Crop Diversity and In Situ Conservation Strategies in the Caribbean Region of Colombia." Bogota, Colombia.

**COMPREHENSIVE PLAN FOR THE RECOVERY OF INFERTILE SOILS WITH
REGENERATIVE AGRICULTURE AND CONSTRUCTION OF NATIVE SEED
BANKS IN INDIGENOUS TERRITORIES TO GUARANTEE FOOD SECURITY**

5. Informative article published in Semillas Magazine (2018).
Martínez-Castillo, R. and Nieto-Gómez, R. "Reviving Native Seeds: Community Initiatives in the Zenú Community." Issue No. 72, pp. 14-21.

6. Master's thesis from the University of Córdoba (2017). Pérez-Martínez, M. "Valorization of the contribution of native crop varieties to food security and the conservation of agrobiodiversity in the Zenú community". Montería, Colombia.