

CASE STUDY:

Activities by the Guatemala Sugar Agroindustry supporting the implementation of the Sustainable Development Goal 15 (SDG 15) of the United Nations 2030 Agenda for Sustainable Development.



Photographer: Oscar Rodolfo Morales Méndez, ICC





**PROTECT, RESTORE AND
PROMOTE SUSTAINABLE
USE OF TERRESTRIAL
ECOSYSTEMS, SUSTAINABLY
MANAGE FORESTS,
COMBAT DESERTIFICATION,
AND HALT AND REVERSE
LAND DEGRADATION AND
HALT BIODIVERSITY LOSS**



SUSTAINABLE
**WATER &
ENERGY**
SOLUTIONS
NETWORK



All rights reserved. 2023, Association of Sugar Producers of Guatemala (Asazgua)

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss / Asazgua

Editorial Board:

Alfredo Vila
President of Asazgua

Luis Miguel Paiz
CEO of Asazgua

General Coordination: International Affairs Office, Association of Sugar Producers of Guatemala (Asazgua)

Editing and writing: Iván Vera, Alex Guerra, Luis Fernando Salazar

Text Reviewer: Ivy Contreras

Collaborators: Luis Fernando Salazar, Gustavo Paredes, Lorena Flores, Leonel Díaz, Kelly Rosales & Ivy Contreras.

Design and Layout: Communications Department, Asazgua

Association of Sugar Producers of Guatemala (Asazgua)

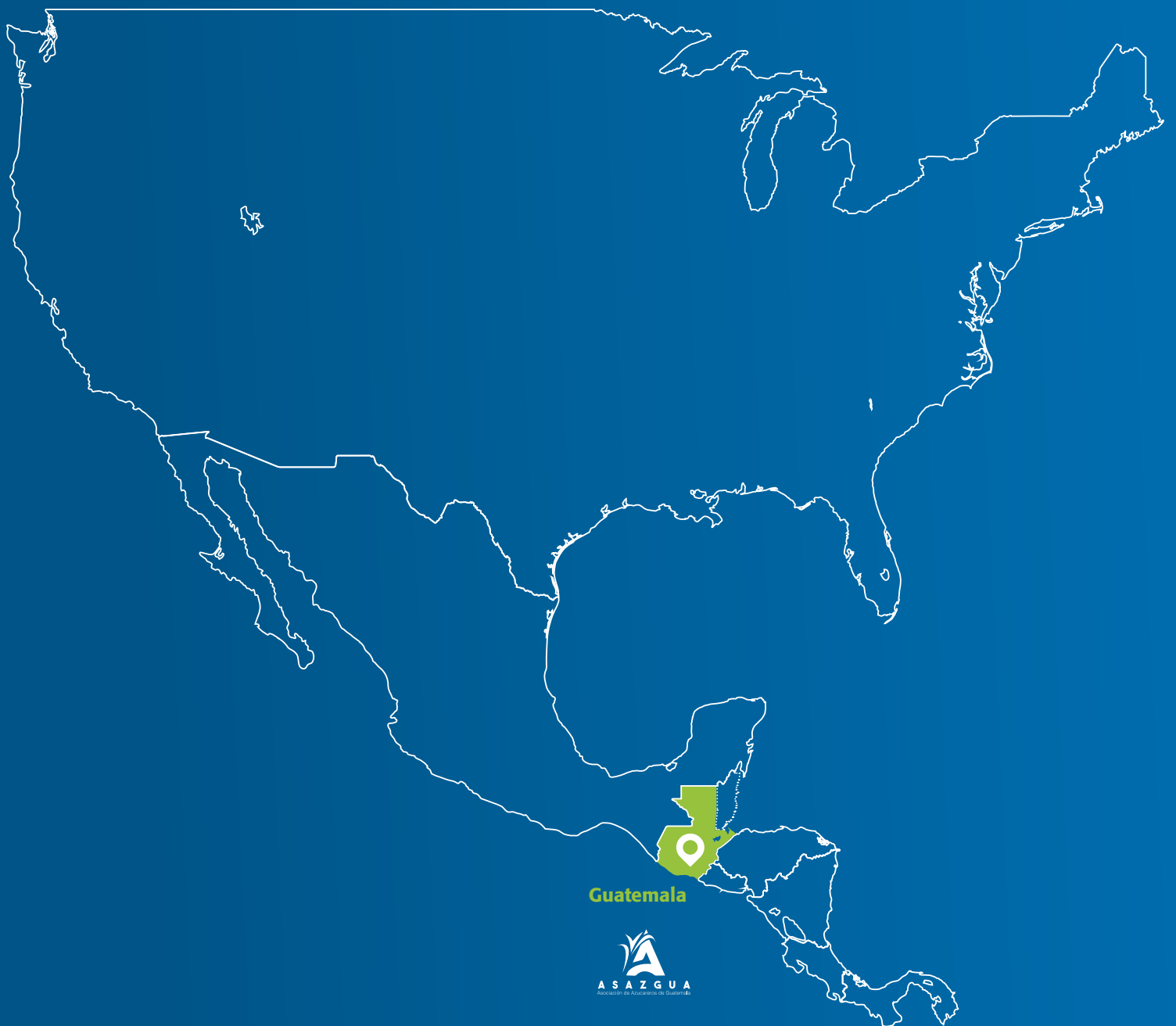
PBX: + (502) 2215-8000

Address: 5th avenue 5-55 zone 14

Eurolaza tower 3 building, level 17 and 18 / 01014

Guatemala City, Guatemala

Association of Sugar Producers of Guatemala (Asazgua)



Guatemala



CONTENTS

THE GUATEMALASUGAR AGROINDUSTRY	8
SUSTAINABLE DEVELOPMENT STRATEGY	9
THE GUATEMALA SUGAR AGROINDUSTRY AND THE SDG 15	10
1. Protection and Restoration of Forests	11
2. The Guatemala Sugar Agroindustry Biological Diversity Conservation and Restoration Guidelines	15
INTERLINKAGES WITH OTHER SDGs	17
CONCLUSIONS	18
REFERENCES AND SOURCES FOR ADDITIONAL READING	19

SDG 15: PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND HALT AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS



Target 15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.

Target 15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.

Target 15.4: By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.

Target 15.5: Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.

Target 15.6: Promote fair and equitable sharing of the benefits arising from the utilization of genetic resources and promote appropriate access to such resources, as internationally agreed.

Target 15.7: Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products.

Target 15.8: By 2020, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.

Target 15.9: By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

Target 15.a: Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.

Target 15.b: Mobilize significant resources from all sources and at all levels to finance sustainable forest management and provide adequate incentives to developing countries to advance such management, including for conservation and reforestation.

Target 15.c: Enhance global support for efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities.

Source: United Nations, 2015.



The volcanic soils of southern Guatemala are exceptional for the growth of sugarcane

THE GUATEMALA SUGAR AGROINDUSTRY

As of 2021, Guatemala was the third largest producer in Latin America and the sixth largest exporter of sugar in the world. Sugar is the second agroindustrial product most exported of Guatemala. The Guatemala Sugar Agroindustry generates almost US \$700 million in foreign exchange annually and provides more than 55,000 direct jobs and 278,000 indirect jobs in the country. Besides, the sector receives products and services from more than 6,000 small, medium-sized and large enterprises, which also generate more employment. Only 2.97% of the cultivable land in Guatemala is used for sugarcane production. Asazgua, the Association of Sugar Producers of Guatemala, was created in 1957 to coordinate the activities of the Guatemala Sugar Agroindustry. It includes 11 sugar producers and five technical organizations specialized in research, climate change, sugar exportation and social responsibility (Asazgua, 2020). In addition, since 2022, it counts with an organization specialized in innovation. The sugar producers that are members of Asazgua include: Pantaleon, Concepción, Palo Gordo, Santa Ana, Magdalena, Santa Teresa, La Unión, Madre Tierra, Trinidad (San Diego), La Sonrisa and El Pilar.

The Guatemala Sugar Agroindustry is committed to generating opportunities and prosperity for the people of Guatemala that support the country's sustainable development. It promotes decent and valuable jobs for the wellbeing of the population, while at the same time promoting environmental protection and conservation.

The Guatemala Sugar Agroindustry follows sustainable development principles as reflected by its strategic objectives and integrated actions and programs, supporting social wellbeing, economic growth, industrialization, and environmental protection. The activities of the sugar industry

in Guatemala are recognized as examples of "Good Practices" in the effective implementation of the United Nations 2030 Agenda for Sustainable Development and the Sustainable Development Goals.

Associated organizations supporting specific sustainable objectives of the Guatemala Sugar Agroindustry have been created in the last decades. In 1990 Fundazúcar was launched as the social branch for the development and implementation of programs and projects on health, education and development. In 1992 Cengicaña started research activities to develop new varieties of sugarcane, to have integrated pest management, to study land quality and to implement more efficient processes for the cultivation of sugarcane and for the production of sugar. In 1994 Expogranel, one of the most efficient boarding terminals for sugar export in the world, was launched to cover international markets in a more efficient and competitive manner. In 2010, the Private Institute for Climate Change Research (ICC) was created to perform research, activities and projects related to climate change. In 2022 the Innovation Hub was created to develop a program of innovative projects through the identification and optimization of products, activities, processes and business models of the Sugar Agroindustry.

At the international level, the Guatemala Sugar Agroindustry supports the work of ICC on climate change mitigation and adaptation with other countries of Central America. Also through Asazgua, it participates actively in the Global Network on Sustainable Water and Energy Solutions. This is an initiative led by the Division for Sustainable Development Goals of the United Nations Department of Economic and Social Affairs (UNDESA). The Network promotes integrated water and energy solutions that address climate change objectives worldwide.

SUSTAINABLE DEVELOPMENT STRATEGY

The Sustainable Development Strategy of the Guatemala Sugar Agroindustry is based on its vision, mission and objectives which promote a comprehensive and forward-looking transformative pathway to prosperity and peace for the people of Guatemala, at the same time supporting a healthy and sustainable planet. It follows an integrated approach based on transformation and adaptation to changes expected in the future due to new challenges. With its inclusive participation policy with multi-stakeholder

partnerships, the Sugar Agroindustry, through Asazgua, is committed to coordinating the work of enterprises, governmental entities and civil society to achieve the final goal of prosperity and sustainable development for Guatemala. The Guatemala Sugar Agroindustry is a global example of efficiency and technological advance representing a very relevant factor for the economy of Guatemala with important positive impacts also on the social and environmental dimensions of sustainable development.

Objectives

1. Increase productivity through development and improvements in the field and in sugar refineries
2. Provide technical training and capacity building for human resources
3. Develop projects and programs that increase the capacity of the production systems in the field and in sugar refineries, in distribution and commercialization of products, and of the export boarding systems.

Vision

Before 2025 the Guatemala Sugar Agroindustry will be the most respected productive sector of the country due to diversification, competitive efficiency, generation of dignified jobs, and respect for the environment, suppliers and communities with whom it relates.

Given its policy of unified action, proactive attitude and strong socioeconomic support, the Sugar Agroindustry leads as a positive agent of change for integral development, boosting the progress of its members and the country.

One of the objectives of the Guatemala Sugar Agroindustry is to Increase productivity through development and improvements in the field and in sugar refineries.



Mission

The Guatemala Sugar Agroindustry mission includes the following: to act in united manner to cultivate and process sugarcane to produce sugar, electricity, ethanol and other products; to undertake other activities to increase the value of the associated enterprises with a positive impact on the integrated development of the country; to innovate constantly improving competitive efficiency; to facilitate national and international commercialization of sugar; and to ensure sustainability while building trust responsibly.



THE GUATEMALA SUGAR AGROINDUSTRY AND THE SDG 15

The Guatemala Sugar Agroindustry has multiple initiatives in place supporting the objectives of SDG 15 which are “Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.” Most of the activities supporting these objectives are implemented by the Private Institute for Climate Change Research (ICC).

ICC is a non-profit organization created in 2010 by the Sugar Agroindustry to perform research, activities and projects related to climate change, with particular focus on the Pacific Slopes of Guatemala. The ICC acquired legal status in 2012 and works independently through funding by companies, foundations and aid agencies. The ICC works hand in hand with local stakeholders, mainly communities and producers and in partnership with governmental organizations, especially municipalities and other local entities. It also works with universities, non-governmental organizations, and international organizations.

The most important activities of the sustainable development strategy of the Sugar Agroindustry supporting the objectives of SDG 15 include the restoration of forests and the biological diversity conservation and restoration guidelines. As a result of the combination of these initiatives, the Sugar Agroindustry is able to continuously support activities for the protection of terrestrial ecosystems including forests and for reversing land degradation and reducing biodiversity loss in Guatemala particularly in the region of influence of this agroindustry.



1. PROTECTION AND RESTORATION OF FORESTS

1.1. Protection and Restoration of Forests

Objectives and Description

The Pacific lowlands of Guatemala have been the ideal location for sugarcane production. As the cultivation of sugarcane is of great importance to the country and particularly for southern Guatemala, the Sugar Agroindustry formulated and implemented a strategy for forest restoration as a contribution to the country on this issue and to increase the resilience of this sector to the possible impacts of climate change.

In 2011, the Guatemala Sugar Agroindustry through the ICC initiated a geospatial analysis of forest cover, land use, land use capacity and forest biodiversity. The analysis also included key stakeholder mechanisms and certification commitments that contribute to forest restoration of the main watersheds in the sugarcane cultivation areas of Guatemala, as well as the obligations related to the social and environmental responsibilities of relevant stakeholders. This analysis concluded with a strategy proposal for forest restoration as the first step towards biological corridors and forest connectivity in the Pacific lowlands. The strategy considers the key stakeholders and the different

mechanisms of implementation in high, medium and low areas of the watersheds. These mechanisms jointly serve as the basis to generate the national strategy for forest restoration of Guatemala.

In 2011, the ICC also initiated a process of gathering and analyzing information within the sugar companies located in this region to better understand development issues in the subject of forestry, mainly the land area devoted to conservation and/or where it has been managed with restoration in view. In 2012 these actions concluded with a map that gathered together data about these areas. By the end of this year a total of 10,204 hectares had been quantified. In the following years, the ICC developed various studies to look for opportunities, actions, and key stakeholders on forest restoration, always with the focus on watersheds. These actions added up to the inter-institutional relations that the ICC has achieved in a short period of time and mechanisms of environmental certification adopted by partners, which jointly supported the creation and implementation of the strategy of forest restoration by the sugar sector.

The Reforestation Program has among its priorities the recovery and conservation of the watersheds of the rivers that flow into the Pacific Ocean. As part of the efforts of the technical groups for the use of water from rivers, in 2017 the reforestation of watersheds was initiated for the rivers Los Esclavos, Achiguate, Madre Vieja, Bolas and Peraz.

In 2013, the ICC began to provide support to different institutions for the conservation of forests located in the upper part of five priority basins on the Pacific slope. The support provided by the ICC in these areas has been developed in partnership with different partners and organizations, and has been implemented through work plans that include three main strategic lines: 1) Monitoring and surveillance of the forest, through teams of communication and coordinated patrols with government authorities, and communities/municipalities; 2) Prevention and control of forest fires, building and/or maintaining firebreaks, and equipping and training brigades of community forest firefighters; and 3) Complementary activities, which include the implementation of forest nurseries to help restore degraded areas or those that have been affected by forest fires (ICC, 2020b, p. 61).

As a general objective, ICC planned to contribute to forest restoration of watersheds in the area of influence in the cultivation of sugarcane, and to increase the resilience of the communities and productive systems of the Pacific lowlands of Guatemala in the presence of climate change. To achieve this objective five strategic goals have been defined:

- Determination of potential areas for restoration and connectivity
- Implementation of mechanisms of forest restoration
- Establishment of tree nurseries
- Restoration of the mangrove ecosystem
- Research

The Guatemala Sugar Agroindustry through ICC has implemented since 2011, as one of its main actions, the establishment of forest nurseries to increase the forest cover of the Pacific slopes of Guatemala. This action contributes to mitigation through carbon fixation and also to adaptation

to climate change. In 2012 a strategic partnership started with the National Forestry Institute (INAB, by its Spanish acronym) for the establishment of tree nurseries with native and exotic species of rapid growth and with diverse local uses including energy, construction and for forest restoration. Between 2010 and 2020, 424 nurseries were established in collaboration with 109 communities, 14 enterprises, and 71 municipalities. In that period, a total of 5.9 million trees were produced through the support of the sugar agroindustry. By 2022, this figure increased to 7.7 million. Adding the contribution of other enterprises and organizations, a total of more than 9.4 million trees were planted in this period. The reproduction of 55 tree species was achieved, of which 48 are native (ICC, 2020b).

In 2012, with partners such as the INAB and the National Council of Protected Areas (CONAP, by its Spanish acronym), tests were initiated for mangrove species in a nursery stage and for testing different restoration practices. The mangrove restoration plan for the Pacific slopes was developed in 2016 with strategies for conservation, restoration, and other complementary activities. The plan is a key tool supporting conservation and restoration of the mangrove ecosystem of the Pacific slopes of Guatemala. More than 81 hectares of mangroves have been recovered in the Guatemalan coast in partnership with communities, municipalities, enterprises and the CONAP and the INAB (ICC, 2020b).

In 2012 ICC started actions with members and partners to increase forest cover in riverbanks of southern Guatemala. The first activity was to design tests to restore native species. In 2014 and 2015 these tests were evaluated, and a baseline was generated of the biodiversity of forests in the riverbanks. This includes tree species, birds, reptiles, butterflies, fish, amphibians, and dung beetles. Also, research was conducted on the implementation, follow up and evaluation of the restoration zones.

The ICC in partnership with enterprises, communities and governmental institutions has reforested with native species more than 86 kilometers of riverbanks of the south coast of Guatemala in the last 10 years covering about 410 hectares. These areas are constantly monitored to document their development and to allow improvements in the way these actions are conducted (ICC, 2020b).



Related Targets

These activities are related to most of the targets of SDG 15 including: Target 15.1 on ensuring the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services; Target 15.2 on promoting the implementation of sustainable management of all type of forests; Target 15.4 on ensuring conservation of mountain ecosystems, including their biodiversity; and Target 15.9 on integrating ecosystem and biodiversity values into local planning and development processes.

Challenges

Challenges related to these activities include the difficulty in the access to areas that need reforestation or restoration, invasion of foreign species of grasses, illegal entry of people, cattle entry, and soil compaction. The presence of invasive alien species, pest attacks, forest fires, encroachment invasions, illegal dumps and extreme weather affect restoration activities and create negative impacts on the growth of trees. There is a need for constant conflict management and for ensuring the active participation of local communities. Scaling up is a challenge, particularly in areas where the land use capacity is agriculture and where it is used for different crops.

Creating awareness at all levels of the long-term benefits of an ecosystem service approach that includes protection and restoration of riparian forests is a major challenge.

Lessons Learned

Through these experiences the Guatemala Sugar Agroindustry and ICC have learned about the importance of adopting new restoration techniques using fast-growing plants with good canopy cover during the first phase and then enrichment with other species, which in many cases happens naturally because of seed dispersion by birds and bats. Adequate selection of species allows the rapid formation of the forest canopy and a more efficient control of invasive species. The monitoring of the reforestation efforts should continue even after the work has been completed to verify the success of the interventions. In cases where restoration actions took place in land owned by sugar companies, involving local communities from the outset increases the chances of success significantly.

The program depends on partnerships between private and governmental organizations as well as local communities. Therefore, major efforts are necessary to ensure the active and constant participation and

support of relevant stakeholders for the success of integrated riparian forest management programs. The private sector can be a key active stakeholder, implementing actions within their production system and supporting actions outside them working in collaboration with other stakeholders.

Results

Guatemala is following international trends in terms of forestry and environmental certification. The private sector is identified as a key player in forest restoration of the countryside. The Guatemala Sugar Agroindustry has set a precedent in the investment, implementation of research and actions in forest restoration as a strategy of environmental responsibility, productivity, and mitigation of climate change in the Pacific lowlands of Guatemala.

The Guatemala Sugar Agroindustry has excellent results from these activities providing global benefits in relation to terrestrial ecosystems and climate change mitigation. Through the ICC, the sugar agroindustry together with other enterprises and in-kind contributions from local stakeholders, more than 9.4 million trees were planted between 2011 and 2022.

The Guatemala Sugar Agroindustry has supported the successful implementation of projects for the restoration of riparian forests in the region. The success of these activities and the benefits obtained encourage the planning and implementation of future projects that will translate into further sustainable local development. In addition to the environmental benefits, the program is promoting a cultural change in the relationship between people and nature and in the relationship among people in the participating communities.



2. THE GUATEMALA SUGAR AGROINDUSTRY BIOLOGICAL DIVERSITY CONSERVATION AND RESTORATION GUIDELINES



2.1. The Guatemala Sugar Agroindustry Biological Diversity Conservation and Restoration Guidelines

Objective and Description

In the process of building the Environmental Policy of this sector, one of the key topics that were identified was biological diversity, also called biodiversity (alongside water management, air pollution, use of agrochemicals, and solid waste management). The main objective is to reduce the impact on biodiversity derived from the cultivation of sugarcane and the production of sugar. Also, the sector set out to make contributions to the conservation and restoration of biodiversity within the sugarcane farms as well as in surrounding ecosystems.

Four main areas were determined:

1. Protection of species of flora and fauna, as elements of diversity that interact with the sugarcane crop and surrounding areas
2. Protection of mangroves and wetlands
3. Protected areas and RAMSAR sites
4. Protection and restoration of biological corridors

The process involved the following steps: 1) study flora and fauna species in sugarcane farms; 2) application of the Biodiversity Check tool to assess opportunities to reduce the impact of sugarcane farming on biodiversity; 3) discussion of objectives and guidelines with staff from all sugar producing companies; 4) discussion and approval by the Board of the Association of Sugar Producers of Guatemala.

Studies conducted by the ICC between 2014 and 2021 showed that significant biodiversity exists in the sugarcane farms in Guatemala. 219 species of trees grouped in 61 families were identified. In terms of birds, 248 species belonging to 59 families were found, of which 78 were migratory. These comprise one third of the total number of bird species in the country. Also, 32 species of reptiles and amphibians were identified. Forest fragments within farms were the main sites where species were found. Other groups that have been studied include fish in rivers, dung beetles and butterflies.

Technical assistance from a German government funded program called DaBio was key for the construction of the Biodiversity Guidelines. Run by GIZ in cooperation with the Central American Integration System (SICA), this program fostered initiatives on biodiversity for businesses. The main contribution of this program was technology transfer and guidance for the use of their Biodiversity Check tool. The list of opportunities to reduce the impacts of the companies' operations on biodiversity was the basis for the guidelines that were included in the final document.

Related targets

These activities are related to important the targets of SDG 15 including: Target 15.4 on ensuring the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development; Target 15.5 on taking urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and protect and prevent the extinction of threatened species; and Target 15.9 on integrating ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

Challenges

Monitoring of flora and fauna is costly. A complete baseline on biodiversity was ideal but could not be done at the beginning. Different studies were conducted as funding opportunities appeared. That is also why only a few groups of species have been studied but they were selected because they usually are indicators of ecosystem health or of the presence of other species.

Guatemala has a protected area system (called SIGAP) that is largely underfunded and faces many challenges. Some protected areas in the sugarcane growing region have problems in terms of declaration, zoning and governance, which make it difficult to comply with regulations. They were also seen as opportunities for support from the sugar sector.

Biodiversity within the sugarcane farms is under stress from surrounding areas, including poaching, hunting, tree cutting for firewood and timber, and land invasions. Conservation and restoration do not depend only on companies.

Lessons learned

There are many opportunities within an industry to reduce its impact on biodiversity. The first step is to analyze its interactions in the whole value chain. In the case of sugarcane farms, studying the elements and which species are found in them was a very valuable step. Even though the guidelines at the sectoral level have not been implemented, so far it has been noted that communicating to different levels of staff what biodiversity is, why it is important and how it relates to the industry, is vital.

Results

Considering that the starting year for implementation of the Guidelines for the whole sector is 2022, there are modest results. However, there are many ways in which the sector and individual companies have made substantial contributions to biodiversity conservation. They include improvement of environmental management, reforestation projects, forest protection and other ones mentioned in this publication.





INTERLINKAGES WITH OTHER SDGs

Activities by the Guatemala Sugar Agroindustry related to terrestrial ecosystems, forests, and biodiversity (SDG15) can be interlinked with many of the other SDGs. The strongest interlinkage is related to climate change (SDG13), as the restoration of forests supports climate change mitigation and adaptation. The interlinkage is also very strong in relation to water (SDG6), sustainable agriculture (SDG 2), energy (SDG7), and economic growth (SDG8). Another strong interlinkage is with respect to partnerships (SDG17), given the numerous partnerships of the Sugar Agroindustry and ICC with international, regional, national and local entities committed to the protection of terrestrial ecosystems and to the pursuit of sustainable development.

CONCLUSIONS

A close-up photograph of a green leaf with a small insect on it. The leaf is vibrant green and has a prominent vein. The insect is small and appears to be a caterpillar or a similar larva, clinging to the leaf. The background is a soft, out-of-focus green, suggesting a natural, outdoor setting.

Photographer: Fredy Longo, Cengicaña

The Guatemala Sugar Agroindustry, its members and the ICC have been implementing an extensive program of reforestation and remediation in their areas of influence for decades including in important river watersheds. The sustainable development strategy of the Sugar Agroindustry and its comprehensive program of activities related to reforestation and the conservation of terrestrial ecosystems and riparian forests represent an excellent example of the implementation in the field of the SDG15 and the UN 2030 Agenda for Sustainable Development. Also, the Guatemala Sugar Agroindustry Biological Diversity Conservation and Restoration Guidelines and all the related activities being conducted by ICC demonstrate the importance that this agroindustry gives to the conservation and restoration of biodiversity in Guatemala.

The strong interconnection among reforestation, water and climate change are evident for the Sugar Agroindustry, and the current activities and policies related to reforestation are key to support global efforts on climate change and on the conservation of biodiversity of flora and fauna.

REFERENCES AND SOURCES FOR ADDITIONAL READING

Anzueto, M. D. y G. Irungaray (2005): Identificación y Priorización de Corredores Forestales en Guatemala: Estudio Piloto en la Región Nororiental: Las Verapaces, Izabal, Zacapa y El Progreso. Instituto Nacional de Bosques y Ministerio de Ambiente y Recursos Naturales, Guatemala, Guatemala.

Asazgua (2021), Memorias de Labores 2020. Asociación de Azucareros de Guatemala. 2021.

Asazgua (2020), Memorias de Labores 2019. Asociación de Azucareros de Guatemala. 2019.

Asazgua (2020): Azúcar de Guatemala: Evolución de la Agroindustria Azucarera de Guatemala. <https://www.azucar.com.gt/>

Asazgua (2018): Guía Ambiental del Sector de la Caña de Azúcar, Guatemala, Julio 2018.

<https://www.azucar.com.gt/wp-content/uploads/2019/08/Guia-Ambiental-del-Sector-de-la-Ca%C3%B1a-de-Az%C3%ADcar-Acuerdo-ministerial-274-2018-impresi%C3%B3n-150719.pdf>

Asazgua /ICC (2018): Política de Cambio Climático del Azúcar de Guatemala, Febrero 2018.

Bennett, A. F. (2004): Enlazando el paisaje: El papel de los corredores y la conectividad en la conservación de la vida silvestre. UICN-Unión Mundial para la Naturaleza. San José, Costa Rica.

Cengicaña (2012): El cultivo de la Caña de Azúcar en Guatemala. Melgar, M.; Meneses, A.; Orozco, H; Pérez, O.; y Espinosa, R. (eds). Guatemala.

Cordon (2020): The Guatemalan Sugar Industry and its alignment with the UN 2030 Agenda for Development: Case Studies. Isabel Cordon, Asazgua. Presented at the HLPF event on Sustainable Water and Energy Solutions. July 2020.

Guerra, (2019): "Sharing experiences on integrated water and energy management for sustainable development and climate action: the Guatemalan Sugar Industry." presentation at the 2019 United Nations HLPF side event of the Sustainable Water and Energy Solutions, Alex Guerra, New York, July, 2019.

Guerra (2010): Climate-related disaster risk in mountain areas: the Guatemalan highlands at the start of the 21st Century, PhD Dissertation by Alex Guerra, University of Oxford, Oxford, 2010.

United Nations (2015): Transforming our World: the 2030 Agenda for Sustainable Development, A/RES/70/1.

<https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>

ICC (Instituto Privado de investigación sobre Cambio climático) (2020a): Inventario de Emisiones de Gases de Efecto de Invernadero y Huella de Carbono del Azúcar de Guatemala, zafra 2018-2019, Marzo 2020.

ICC (2020b): Informe de Labores 2010-2020, Guatemala, 2020.

ICC (2020c): El impacto de la conservación de bosques y la restauración del paisaje forestal en la captura y almacenamiento de carbono. Guatemala.

ICC (2015): The Strategy of the Guatemalan Sugarcane Industry Organization for forest restoration in the Pacific lowlands By: Gonzalo Alexander López y Luis Enrique Reyes.

ICC (2014): Estrategia de conservación y restauración de los bosques en la vertiente del Pacífico como un aporte a la mitigación y adaptación del cambio climático. Guatemala.

ICC (2012): Mapa de inventario de áreas forestales de la Agroindustria Azucarera de Guatemala en la vertiente del Pacífico de Guatemala (digital). Guatemala.

Instituto Nacional de Bosques -INAB. (2003): Consideraciones Técnicas y Propuesta de Normas de Manejo Forestal para la Conservación de Suelo y Agua. Editado en Guatemala, Guatemala.

International Sugar Organization (2022): "Sugar Year Book 2022", Londres, 2022.

López F., G. (2009): Identificación y delimitación de los bosques de galería de la subcuenca Los Achiotos, Gualán, Zacapa y área de influencia. Elaborado para Fundación Defensores de la Naturaleza.

Ministerio de Agricultura, Ganadería y Alimentación (2010): Capa digital de ríos de la república de Guatemala. (digital). Guatemala

Ministerio de Agricultura, Ganadería y Alimentación (2009): Mapa de Cuencas Hidrográficas a escala 1:50,000 de la república de Guatemala (digital). Guatemala.

United Nations (2015): Transforming our World: the 2030 Agenda for Sustainable Development, A/RES/70/1.

<https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>

Universidad Del Valle de Guatemala, Instituto Nacional De Bosques, Consejo Nacional De Áreas Protegidas, Universidad Rafael Landívar (2012): Mapa de cobertura forestal de Guatemala 2010 y dinámica de la cobertura forestal 2006-2010 (Digital). Guatemala.



SUSTAINABLE
**WATER &
ENERGY**
SOLUTIONS
NETWORK

Association of Sugar Producers of Guatemala (Asazgua)

PBX: + (502) 2215-8000

Address: 5th avenue 5-55 zone 14

Europlaza tower 3 building, level 17 and 18 / 01014

Guatemala City, Guatemala

www.azucar.com.gt