

SDG 15, SOLUTION FOR THE 17 GOALS

Nature is transboundary, as are its riches and problems.

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Background

There is no boundary for plants and animals, much less for water currents and air. Nature is cross-border and of the most promising developments in science, technology and innovation (STI) for accelerating progress towards the SDGs is the 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"(UN,2015). From protection of biodiversity, it will be possible to positively impact the 17 goals. The origin of cultures lies in the relationship and forms of intervention between man and nature.

The main objective of this report is to draw the attention of policy makers to strategic solutions for the following goals:

- **Target 15.5: "Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity";**
- **Target 15.8: "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"(UN, 2015).**

The **degradation of natural habitats** is caused by the use of pesticides, deforestation, soil exploitation through monoculture and the invasion of exotic species. **Invasive alien species, IAS**, are the second biggest cause of global biodiversity loss. Many of these invasive species, especially of the flora, are edible. Also known as **unconventional food plants**. Although, the technology used for the control and dissemination of these species is not sustainable. In addition to culinary use, many of these invasive exotic species too can be used as raw material for the manufacture of products, replacing petroleum, contributing to the reduction of CO² emission.

I bring as an example, the agave species, which have been the object of research for 30 years of the author. The Agave plant is present on the list of invasive exotic species in several countries and adapts easily on five continents. There are approximately 200 species of agave cataloged, among them, the best-known are: Blue

agave, Sisal agave, American agave and Furcraea agave. Currently, the use of these best-known species is very limited. Investment in science, technology and innovation can bring solutions with great impact on the economy through socio-environmental projects.

The technologies currently used for control, management and eradication are not sustainable. Invasive alien species are divided into two main categories. Invasive exotic species that are not used in the local economy belong to category 1 and need to be eradicated, and are even prohibited from being marketed for ornamental use. Category 2 belongs to invasive alien species used in the economy, being controlled and used by a local industry.

The International Union for Conservation of Nature (IUCN) is responsible for the database global of the invasive species, GISD, formed by the group of specialists in invasive species, ISSG. The IUCN (<https://www.iucn.org/about>) is global authority on the status of the natural world and the measures needed to safeguard it. Therefore, given the responsibilities and influence it exercises, the IUCN should not recommend the use of pesticides, but rather warn about the damage and harm they can cause and provide guidance on ways to use the species sustainably:

"Control of *Agave americana* is mainly achieved by using a combination of physical and chemical management techniques. Small plants are usually removed manually, while larger plants can be treated manually and/or with herbicide. Effective chemical treatments include cutting down leaves close to the ground and painting the stump immediately with herbicide and injection of herbicide. Follow up treatment may be necessary, especially for larger plants (Bickerton 2006; Ecoscape (Australia) Pty Ltd 2005; Weedbusters 2010)" (IUCN, 2022).

Biodiversity and ecosystem services are responsible for 55% of the world's GDP. The study, which is based on the Swiss Re Institute's new Biodiversity and Ecosystem Services Index, shows that both developing and advanced economies are at risk (SWISS RE INSTITUTE,2022). The invasion of exotic species generates a loss of more than 5% of the world's GDP, and this loss can be converted into profits if the correct management and control are carried out to eradicate

these species through sustainable use, which can positively impact the 17 SDGs of the 2030 Agenda. The research work on the mapping of IAS, "Mapping the global state of invasive alien species: patterns of invasion and policy responses" presents important data on the asymmetries in the amount of invasive exotic species and native species in the countries (TURBELIN ET AL, 2017). The authors alert international society to the current scenario in Africa and Central Asia as priority regions for future research and control.

The current industry

Of the nearly two hundred species that exist, only three variations are used in the world economy. The agave or tequilana agave is blue of Mexican origin and southern United States, cultivated in Mexico mainly for the production of beverages from its fermentation. According to data released by the Statista, "in 2021, Mexico produced 527 million liters of tequila, the highest volume recorded since 1995. Within two and a half decades, production of this alcoholic beverage increased by approximately 405 percent" (STATISTA, 2022)¹. In India, under the Desmondji label, the company Agave India Industries produces alcoholic beverages, 100% agave, such as tequila, from blue-green Agave, a plant grown in the red and black volcanic soils of India's Deccan.

In the same way, it is possible to produce ethanol and refined sugar or in syrup from this fermentation. The world production of ethanol is approximately 40 billion liters. Brazil and the United States are the world's largest producers, responsible for 70% of this production. Brazil produces an average of 400 thousand liters of ethanol per day extracted from sugar cane (EMBRAPA,2022).

The other species of agave used in the world industry is the Sisalana agave for the production of fibers, ropes and carpets. Brazil is the world's largest producer of sisal and the export of this fiber came to represent for the country, revenues of over 100 million dollars. World production of sisal in 2010 reached more than 350,000 tons of which 235,800 tons correspond to sisal produced in Brazil, which represents more than 67% of world production. The African countries, Tanzania, Kenya and Madagascar, are also major producers of sisal and account on average for 20% of world production and exports (EMBRAPA, 2022).

In Australia, a large-scale factory worth half a billion dollars is producing sugar, electricity, ethanol, livestock

feed, waxes, biodiesel and a host of other products from Blue Agave (ABC NEWS,2018). Google's patent platform shows us how much product has been invented using agave, derived especially from its fibers (GOOGLE PATENTS, 2022).

Another species, other fibers and another product

Some of the other agave species not used in the economy have longer, finer fibers with excellent strength for making fabrics. Some of the other agave species not used in the economy have longer, finer fibers with excellent strength for making fabrics. The fibers of each species have different textures presenting different results that deserve special attention from science, technology and innovation. The American agave, an invasive exotic species, is present in several regions, has several varieties and applications:

"Agave americana has several uses: ornamental, medicinal, as a vertebrate poison, agricultural, fodder, erosion control. Is grown as an ornamental on all continents, except Antarctica. Fibers derived from A. americana have been shown to be more extensible than other natural fibers, and also exhibit high tensile strength and are low density and have a high moisture content. Ropes and twines made from A. americana fiber were important agriculturally (otherwise) in North Africa up until the 1960's. Is grown in South Africa as a fodder crop, although it cannot be directly grazed and requires processing before feeding. Used to brew an alcoholic liquor beverage, in Mexico and South Africa. Used in Mexico, Brazil, India and China as a traditional treatment, as it has anti-inflammatory, anti-bacterial and anti-fungal properties and can be used as a diuretic" (IUCN,2022).

Dispersal: *Furcraea foetida* alien invasive specie

Originally from north of South America and Central America, *Furcraea foetida* is classified as category 1 in the list of invasive alien species (IAS) from several countries on five continents². Was introduced as an ornamental and for its fiber. Its inflorescences produce bulbets in large quantities that disperse naturally and form dense impenetrable stands which exclude native vegetation (IUCN,2022). Despite its natural richness being similar to the American agave and with an even

¹ See in <https://www.statista.com/statistics/311696/mexico-s-tequila-production>

² Occurrence map *furcraea foetida* (GBIF). See in https://www.gbif.org/occurrence/map?taxon_key=2769796

longer fiber, which adds greater value to the textile industry, this species is not being introduced into the economy. In this way, its dispersion and invasion is a current problem for biodiversity and international security.

International security depends on environmental security

Central to security analysis is understanding the process by which threats manifest themselves as security issues on the political agenda, because not everything can become security, because not all political issues are given the same security priority and importance (BUZAN et al, 1998, p.24). In order to define environmental security as an international security sector, it is necessary to understand the logic of the threats and vulnerabilities of this universe based on three principles: threats to civilization, threats to human activity, and threats caused by human activity. Threats to human activities are the main reason to talk about environmental security, because they represent a cycle of threats between civilization and the environment, in which the civilizing process involves the manipulation of the rest of nature which develops proportions of self-destruction. (BUZAN, 1998) Another way of identifying the threats of invasive alien species to international security is through analysis based on International Security Studies, through impacts on the military, economic, political, societal and environmental sectors. Conforme análise realizada pela autora, as IAS impactam e ameaçam em todos os setores, tornando-se uma ameaça à segurança internacional (DONDONI, 2017, p.17 – 22).

Advocacy: agreements and regulations

It is important to highlight the regulations that regulate the system and the international community, where the signatory countries, through the signed and ratified agreements, create and approve new laws through their local governments to fulfill the established goals and objectives.

Rio Declaration on Environment and Development, Anexo I, Principle 2 of the United Nations Conference on Environment and Development:

“States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas

beyond the limits of national jurisdiction” (UNITED NATIONS, 1992).

The Future We Want, Outcome document of the United Nations Conference on Sustainable Development:

“...We acknowledge the role of access and benefit-sharing arising from the utilization of genetic resources in contributing to the conservation and sustainable use of biological diversity, poverty eradication and environmental sustainability” (UNITED NATIONS, 2012).

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity is an international agreement which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way. It entered into force on 12 October 2014 (CDB, 2022).

The international community has set the Aichi Biodiversity Target 9 of the Convention on Biological Diversity (CBD, 2010) to ensure that measures are taken to prevent the introduction and establishment of IAS:

By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment (CDB, 2022).

Article 6. General Measures for Conservation and Sustainable Use:

(a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and

(b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies (CDB, 2006).

Local actions and policies, experiences carried out by author

After mapping and investigating the agave species planted on public roads in the city of Porto Alegre, Brazil, the author discovered that the organic residues resulting from pruning, that is, agave leaves, were thrown away without any kind of use. Therefore, a cultural inclusion project was presented to the

Municipal Department of Culture, where communities from the periphery were trained to extract the agave fiber and transform them into art and craft objects. At the same time, a proposal was presented to the 4th Municipal Environment Conference requesting the use of agave pruning for the workshops held by the Secretary of Culture, making resources available to the community. The approval was unanimous, creating Resolution nº 49 of the thematic group Areas for the Protection of the Natural Environment³ (SMAM, 2006).

In Garopaba, SC, Brazil, a large invasion of the agave *Furcraea foetida*, IAS, was identified. After mapping the invasion sites, the Civil Defense, author of the control, management and eradication of the species was requested. The surrounding communities were invited to participate in the training workshops, thus ensuring the distribution of resources⁴ (GMÍDIA, 2019). The lack of encouragement and engagement from the city hall did not sustain the initiative.

CONCLUSION

Usually, the invasion of an exotic species of flora or fauna is identified when its dispersion is already at an advanced stage with a considerable volume on native species. This considerable volume can be transformed into genetic resources, and should receive special attention from science, technology and innovation with projects aimed at local or emerging needs mentioned in the International Conventions on the Environment, Human Rights and the International Labor Organization. The control of these species must be done in a sustainable and urgent way, in line with the Sustainable Development Goals of the 2030 Agenda, with the distribution of resources and opportunities to the communities surrounding the occurrences, facilitating logistics, respecting equal rights and promoting the reduction of inequality. All interested parties, without leaving anyone out, should be able to undertake in a group or individually. People declared as low-income or registered in the Social Assistance Secretariats database, must be invited to participate, as well as receiving free technological training to transform raw materials into sustainable products that bring solutions to current problems as well as receiving free technological training to transform raw materials into sustainable products that bring solutions to current problems, especially in the inclusion of new foods, medicinal products, natural cosmetics, energy and in

the substitution of synthetic, chemical or petroleum products that contribute to a fair and circular economy.

One of the major problems that ecosystems have faced is the pollution of rivers and oceans by pesticides, chemical dyes, plastics and synthetic microfibers from agriculture and the fabrics of the clothes we wear when they are washed. Replacing synthetic fabrics with cotton fabrics is not enough, as the exploitation of the cotton market and its extraction and production processes are also a global and unsustainable problem. Uma das soluções apresentadas na presente pesquisa é a utilização da fibra de agave. Another species that deserves attention and investment in research because of its texture and aroma is the *Hedychium coronarium* “is a perennial flowering plant in the ginger family Zingiberaceae, native to the forest understorey of Asia” (WIKIPÉDIA, 2022). This species is an invasive exotic in South America.

UNESCO, in its World Report, calls the attention of international society to the importance of cultural diversity, respect and appreciation of local cultures. The ancestral technologies, intangible heritage, can be improved and collaborate with the sustainable development of different communities. Incentive policies with investment in projects from local resources are necessary. Public-private partnerships need to be more comprehensive, involving different actors in society.

³ See in

http://proweb.procempa.com.br/pmpa/prefpoa/smam/usu_doc/resolucoesivconf.pdf

⁴ See in

<https://www.garopabamidia.com.br/noticias/titulo/10183/iniciativa-convida-a-comunidade-para-controle-populacional-das-piteiras>

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