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RETRACING THE CERRADO BIOME

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The recomposition of biomes is a matter of great importance to enter the ecological agenda of the century 21. For Brazil, a country with extraordinary biodiversity in its seven biomes – Mata Atlântica, Cerrado, Caatinga, Amazônia, Pantanal, Campos do Sul e Costeiro/Marinho – has extraordinary value.

The Cerrado with area of two million km², the equivalent to 22% of the national territory, is the second largest Brazilian natural environment, just behind the Amazon biome, and which is suffering great anthropic action by virtue of the expansion of the agricultural frontier. The preservation of its natural biodiversity is necessary, including for better scientific knowledge and obtaining technologies with application in the productive process.

In this sense, a group of agronomists, forest, biologists and technicians has sown, in November 2016, 80 species of – gramineous, shrubs and trees – native of the Cerrado Biome, in an experimental plantation of 96 hectares, in the municipality of Alto Paraíso, Northeast of Goiás in the National Park of the Chapada dos Viadeiros. In March 2017, the plants – already with ten centimeters in height – began to make a green carpet over the area before occupied by a hayfield of African species, which grow quickly and take the space of native trees.

This group called "Restores Cerrado" is associated with the researchers of the Chico Mendes Institute for Biodiversity Conservation (ICMBio), of the Embrapa Genetic Resources and Biotechnology, of the Embrapa Cerrados and Brasília University (UNB). The technique of planting adopted consists in the application of seed already mixed with earth over an area to be restored.

Studies indicate that the direct seeding can have a cost about eight times smaller than that of the planting of seedlings of trees. So you can make as a technique to be used, increasingly, to recompose the original vegetation of a biome. This is because the system even more employee consists in the initial cultivation of plants in nurseries, before being taken to the field.

The problem is that the species of native vegetation, in this case, the Cerrado, form very long roots and, to be produced in nurseries, need support - plastic bags or tubes - too long. *"It is common for a tree to five years of age have a few centimeters in height and several meters of root",* is what maintains the forest engineer Alexandre Sampaio, Researcher at the National Center for Biodiversity Assessment and Research and Conservation of the Cerrado of the ICMBio.

On the other hand, *"direct seeding of shrubs and native grasses allows the rapid occupation of soil, reducing the need to skim and apply herbicide between planting rows of trees,"* says biologist Isabel Belloni, professor of the UNB.

This work is not a pioneer, three plantations, between 2012 and 2014, with direct seeding into smaller areas in the Chapada dos Veadeiros, and four in the Federal District were performed. This technique has also been evaluated by another group of research in the state of São Paulo.

These plantations, the Chapada dos Veadeiros, during two and a half years, there has been monitoring the growth of 50 native species of trees, 12 shrubs and grass 13. After the first year, 36 tree and shrub species five showed survival above 60%, considered satisfactory.

Some plants have reached 90%, as the cajuí (*Anacardium humile*), bush of up to two meters, known as the cashew cerrado, colored red, white and juicy pulp used in juice, sweets and liqueurs. The native gramineous such as *Andropogon fastigiatus* and *Aristidia riparia* has already covered 30% of the area at the end of the first year after planting, according to an article of March 2017 in Brazilian Journal of Botany.

Another technique that is also being used is the Topsoil. It consists in the transposition of the superficial soil layer of preserved areas for abandoned pastures and other areas to be occupied by native vegetation. In the topsoil removes a layer of 30 to 40 cm from the ground, rich in organic matter, microorganisms, roots and seeds, and transfers this material for the degraded area. Examples: material removed prior to the construction of a hydroelectric plant or the deployment of a mining área.

The practice of this technique occurred in November 2013 in an area of two hectares, 10 km from Brasília, to allow the expansion of a cement factory. Then, the material was deposited in a pasture abandoned the 1.4 km away. Six months later, the pieces of trunks and roots that sprout again represented 74% of the number of tree species of the original area, where he came from the topsoil.

After 28 months, grew there 51 species of trees, eight of vines, shrubs and 12 of 34 herbs, indicating that diversity had begun to establish themselves. It is the story of the ecologist Daniel Vieira, a researcher from Embrapa Genetic Resources and Biotechnology, and the biologist of the UNB Maxmiller Ferreira that accompanied the *process.*

"In the density of trees was 11 times higher in comparison with the technique of restoration of Cerrado made from the planting of seedlings, which in general provide a predominance of arboreal species and leave aside the lianas, shrubs and grasses are important in the beginning of regeneration and recovery of ecological processes," explain the researchers.

The results of these researches are leading the Federal District and the state of Mato Grosso to pose as official programs. *"Based on the results of these researches we are incorporating the transfer of topsoil and direct seeding the rules of environmental compensation,"* says Raul do Valle, head of the legislative legal advice of the Secretariat of Environment of the Federal District.

Mato Grosso, with approximately 60% of the territory originally covered by Cerrado, also seeks to regulate the restoration of degraded areas using these techniques, which, as well as the Federal District, will be monitored. *"We will evaluate the soil cover, richness and density regenerantes natives - roots, trunks, tubers etc - allied to the evaluation of satellite images, photographs and surveys in the field",* explains the biologist Lígia Nara Vendramim, environment analyst of the Secretariat of Environment of Mato Grosso.

Another initiative is the research group restores the Cerrado and the Network of Seeds from the Cerrado, which promotes the collection of seeds and distributes for forest restoration projects. They have also published a Guide to Restoration of the Cerrado (bit.ly/guiacerrado), promote courses for rural producers and participate in discussions with the formulators of public policies and agricultural fairs to disseminate the techniques of restoration among potential users.

The difference between these methods and the natural regeneration - cheapest - is that the latter is very slow and not always meet expectations may take up to 20 years, regeneration time of secondary vegetation. *"In the case of producers who are serving judicial arrangements of environmental recovery has a few months or a few years to redo the Restoration,"* according to the agronomist Peter Brancalion, Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo (Esalq-USP).

Their conclusion is the result of analysis of 42 programs for companies that needed to restore areas of Atlantic Forest, the Amazon and the transition of these environments with the Cerrado, to comply with the Forest Code or agreements with the Justice. This analysis is in the Biotropica magazine, November 2016 edition, published by the Association of Tropical Biology and Conservation.

The Brazilian Academy of Science (ABC) and the Brazilian Society for the Advancement of Science (SPDC), not only support these methods of regeneration of native vegetation, as they emphasize the implementation of the National Policy of Recovery of the Native Vegetation (Proveg).

It is important that the municipalities adhere to the application of these techniques in partnership with producers, state government and businesses, in order to recompose the native vegetation of their respective deforested areas.