

# The costs of planting a botanical garden

By Dexter B. Dombro

There have been several comments by Tree-Nation members regarding the higher cost of trees in the *Sacred Seeds Botanical Garden* project. I thought it important to explain the reason for this. Those higher costs were not picked out of the air, but rather are based on some very real everyday problems. The [Sacred Seeds Botanical Garden](#) at *La Pedregoza* is dedicated to planting traditional medicinal and alimentary plants of the Orinoco River basin of Colombia. The knowledge about their uses is being lost in the modern world, yet many of them are essential for a healthy planet, for biodiversity and as natural ingredients in modern medicines. Unfortunately, many of them are endangered, vulnerable, over exploited or being destroyed to make way for urban expansion or agricultural activities. This means that we face several obstacles in our work as a botanical garden.

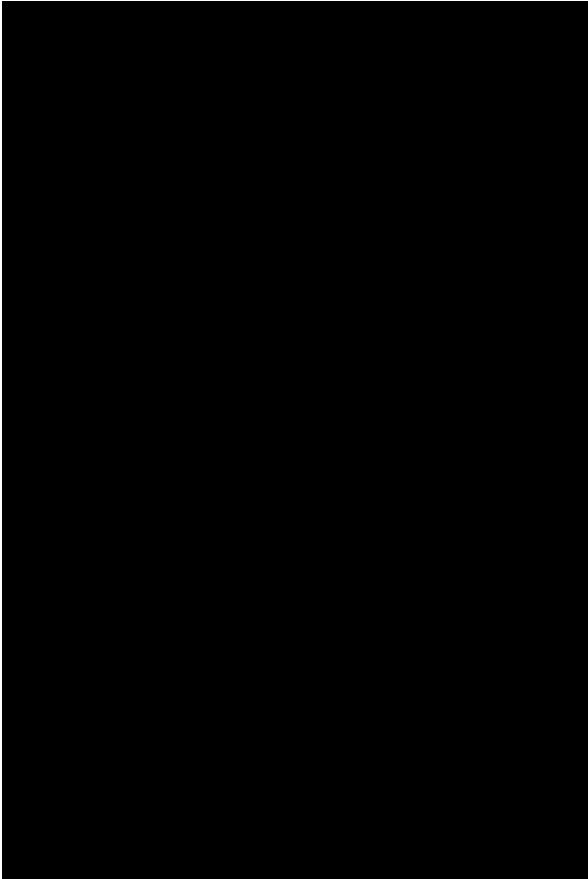
The *Sacred Seeds Botanical Garden* site in the white outline inside the *Reserva Natural La Pedregoza*, as seen from the air. The *La Pedregoza* tree cultivations are to the right, the *Rio el Bitá* along the bottom.

The first issue is the sourcing of seeds. There are no dealers or suppliers of seeds for the majority of native trees. This means that someone has to go into the rainforest to collect the seeds, which makes the process expensive. Here are some of the problems:

- a. Many trees are male and female, so a tree we identified during the year might not have seeds at all, because it is male.
- b. In the Orinoco River basin many seeds ripen just as the annual inundation starts (May or June), so access to the forest and to specific trees can be difficult, or even dangerous.
- c. Once the inundation starts, seeds that fall from a tree cannot be collected, because they have already been lost.
- d. Many animals like the seeds once they are ripe, so collecting the seeds can be a race against time to avoid finding a tree picked clean by birds, monkeys, insects or other wildlife.
- e. Climbing the tree to pick seeds can be very dangerous, so usually a seed collector needs a support person to assist them or to get help if there is a problem. (See the article entitled "[Collecting Native Tree Seeds](#)" on Tree-Nation).
- f. Many of the endangered trees we want to propagate are in remote locations, so travel by vehicle, boat and on foot is required, with all the logistical complications that entails.
- g. Some seeds have high moisture content, so they do not last for long periods of time before going bad. This means they need to be delivered to the tree nursery as quickly as possible once collected.

This *Sassafras* tree is male and has no seeds.

The second issue are those involving tree nursery operations for specialized medicinal and alimentary trees. These are practical problems that can cause our costs to be much higher than with known tree types, as losses may be greater and material requirements larger. Here are some examples:



Francisco Castro, our indigenous botanist, working with a native tree species.



Dexter Dombro of our environmental NGO, the *Corporación Ambiental La Pedregosa*, reviewing site selection at the *Sacred Seeds Botanical Garden* site.

- a. The tree nursery does not know how many seeds will be delivered, or what species they might be. However, we need to prepare planting bags or containers with substrate in advance so that there is no delay in planting. Our tree nursery has to prepare a lot of bags based on estimates, bags which may not be used, as it is better to have too many than too few. It takes time and materials to do this.
- b. Often, the tree nursery is not sure if the seeds delivered by the seed collector are actually the species the seed collector says they are. Errors can happen, and many seeds are confusingly similar. This means resources are sometimes used on trees of a lesser value that are not actually an endangered or special species.
- c. There is very little known about the preparation of native tree seeds. For instance, some seeds need to be boiled, others need to be sanded to sprout better, yet others need to be soaked for 48 hours, while some fail if they are soaked for more than one hour. This means there is a lot of trial and error in germination, with germination percentages much lower than with well-known tree species. Unfortunately, there is a considerable loss of a percentage of the seeds collected, upping costs.
- d. There is generally nothing known about a native tree's requirements in the tree nursery, such as root development, shade or sunlight requirements and other factors. For example, that means that we have to use larger than normal planting bags to prevent losses due to fast root formation, and we spend more time observing seedlings to see how they react to shade or sunlight. Larger planting bags mean that we need a lot more treated substrate, and that the bags are more expensive. It also means that workers have greater difficulty in managing the bags inside the tree nursery, as they may weigh up to 3 KG more than do the bags of other common seedlings in smaller planting bags.
- e. There is little known about the susceptibility of native trees when they are young or freshly germinated to insects, fungi or other health problems, which means that we sometimes experience seedling losses before we have identified a problem or figured out an appropriate treatment.
- f. Possibly one of the most costly problems is the time needed for specialty plants in the tree nursery. While plantation species rarely spend more than 4 months in the tree nursery, many native trees are not even ready to be germinated until well into the normal planting season. This means that by the time they are ready to go into the field, it is already too late in the season to plant them, in other words the main rainy season has already passed (September or October). The result is that these specialty trees need to be maintained for up to a year (next planting season) before they can be placed in the *Sacred Seeds Botanical Garden*, a serious additional expense.

The third issue is planting the specialized trees in the botanical garden, and planting surplus trees in an appropriate area outside of the botanical garden. The usual plantation style processes simply don't work, because the numbers are much smaller. There is a big difference between planting 10 medicinal trees as opposed to 4,000 plantation trees. This process is therefore, once again, much more expensive than standard tree planting. Here are some examples:

- a. Soil preparation is less likely to be simply plowing, which means it is more labor intensive and hence costlier. Our indigenous botanist, *Francisco Antonio Castro Lima*, selects a location within the garden that corresponds to a specific species needs, such as damp soil or well-drained soil, more shade or less shade, slope or flat area, and coordinates that with any preferences a tree may have for the types of neighboring trees planted nearby. This is very different than having a tractor prepare a large flat area for planting.
- b. A botanical garden should seek to emulate the soil conditions of a natural forest in the region. This means that we use a 4 holes system to plant each tree. 3 holes are dug in a triangle within a 1 square meter area (a square yard plus), with a fourth hole in the middle of the triangle. All of these holes are up to 75 cm or 30 inches deep. The holes are sprinkled with *Calfos*, a special mix of lime and phosphorus that reduces soil acidity and provides phosphorus, an essential element for trees. The middle hole is also given 1 KG (2.2 lbs) of organic compost, 1 KG of black soil taken from a low lying area rich in organic material, a handful of mycorrhizal soil, and one or two 250 gram balls of specially prepared cow manure to establish soil microfauna.
- c. Next, the medicinal tree is planted in the middle hole, by carefully removing the large planting bag without the roots being exposed. The hole is filled so that it is level with the surrounding terrain. A special marker is placed next to the seedling at the time of planting, so that we can track the species, the date of planting, and the location on a botanical garden map and in our records. Every tree has its own form, like a birth certificate. This means that unlike large scale plantation areas that have one form per 10 hectare lot, each individual tree in a botanical garden has its own paperwork, adding to the costs of the process.
- d. The other 3 holes are filled with organic material, which can consist of cut grass, leaves, twigs, cow dung, rotten fruit, compost, black soil and cardboard or paper, to basically create mini-compost piles close to the specialty tree. As the newly planted tree starts to grow, its roots will seek out the nutrients in the outer 3 holes, resulting in a healthier and faster growing tree. It also ensures that the area around each tree develops microfauna in the soil, which in turn results in healthier soil in the botanical garden. This is a costly approach to fertilization and soil improvement and to growing our medicinal trees, one which is quite different from just adding fertilizer in a plowed row when planting on a larger scale.
- e. Individual medicinal and alimentary trees in the *Sacred Seeds Botanical Garden* require more intensive care than do standard plantation trees. Each tree is much more expensive to start with, and represents a considerable investment after leaving the tree nursery and being planted. Exercising a higher level of care therefore makes good economic sense. For example, we may be required to water trees in the dry season, something that is not commonly done with plantation trees, and to continue to add organic material in future years.



It is much easier to simply plow and fertilize a line for tree planting. A good tractor operator can prepare 5 hectares of soil a day.



In contrast, preparing individual planting holes and organic material holes takes a lot more time and more than one worker. At La Pedregoza we make 22 cm or 9" planting holes.

The final issue is simply the fact that we are creating and running a very specialized botanical garden, which implies costs that are considerably higher than in other tree planting activities. Of course there is the cost of paths, plans for visitors, fencing, irrigation and other infrastructure, but it is the **ethnobotanical** costs I would like to mention as a final example:



One year old medicinal tree species in the La Pedregoza tree nursery, waiting to be planted in the *Sacred Seeds Botanical Garden*.



Native tree seedling planted and marked at La Pedregoza.

- a. We are creating a database of every medicinal and alimentary tree species in the *Sacred Seeds Botanical Garden*. This includes much more than the standard botanical description of the tree, together with their scientific and common names. Part of the project includes recording the indigenous names of each tree or plant in the *Guahibo*, *Sikuani*, *Arawak* and other languages of the region.
- b. That same database will also include the recipes that were used to prepare the medicines or foods derived from those trees, as well as how the medicines may have been applied by shamans or by traditional healers.
- c. We also want to record the songs, poems or oral traditions surrounding those trees so that the knowledge is not lost to future generations. Many traditional medicines had a psychological element that went hand in hand with the physiological and chemical properties of the treatment.
- d. This means that we require the goodwill of regional shamans and indigenous peoples. It is our intention to make this material available to indigenous people by setting up web sites in their languages, as a resource for future generations.
- e. Our vision requires the services of qualified ethnobotanists and anthropologists, something that is not always usual in a standard botanical garden. It is our desire to have the *Sacred Seeds Botanical Garden* serve as an educational resource for people everywhere.
- f. Finally, we are hoping to eventually become a seed bank for endangered, vulnerable and specialized tree species, with well-documented instructions on how to germinate, cultivate and maintain each of these native tree species, so that others will be encouraged to start cultivating them. Our mission includes making sure that everything we do is based on the requirement of biodiversity conservation and environmental sustainability.

I hope this explains why the trees in the *Sacred Seeds Botanical Garden* project on Tree-Nation are more expensive than other trees in other projects. You are helping to fund a lot more than just another tree in the ground, with species that have special issues and problems not commonly encountered in other plantations using more common tree species. This is a labor of love for all involved and for all who are helping to make it a reality, so thank you [Tree-Nation](#) for your generous support!