

## **Is education enough to protect natural resources?**

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Raising public awareness of the importance of natural resources is one of the most important outputs of education nowadays. Although it was understood since long ago when man discovered the intimate relation between plant and human life, environmental education has only recently been accepted as a must at the level of primary and secondary schools, as well as in universities.

UNESCO has outlined many times the importance of making professionals of all branches aware of the importance roles they have in the sense of teaching and promoting the rules and techniques of sustainable development. It is specially relevant to train teachers to expand this knowledge as early as possible with the belief that environmental education is not one more subject to be taught, but it must be included at all levels and at all ages.

Botanic gardens play an important role in public education promoting early attitudes towards life respect, especially regarding the importance of plants.

The Oro Verde Botanic Garden is situated on the campus of the Faculty of Agricultural Sciences of the University of Entre Ríos, near the city of Paraná, Argentina. Recently created and still being developed, it is one of the Argentine botanic gardens supported by the partnership “Investing in Nature” and appointed to develop different targets. Specifically among different outputs, the Oro Verde Botanic Garden must develop a model for the delivery of university botanical education, which can be implemented at other universities in Argentina.

“Investing in Nature” is a partnership between four organizations: HSBC Banking Corporation plc., BGCI, Earth watch and WWF, with financial support from HSBC. The specific aim of the BGCI participation is to “establish the value and importance of the world’s plant species in sustainable development and for the global environment, and build a self sustaining network of the world’s botanic gardens, in which they are able collectively and individually to (a) undertake rescue operations of threatened plants ensuring their long terms protection, and (b) contribute to sustainable development supporting economies livelihoods and the environment.”

Simultaneously, a Memorandum of Understanding outlined the terms of a Partnership agreed between BGCI and the Oro Verde Botanic Garden with the aims of:

- promoting public understanding of the relationship between the plant world, humanity and the rest of nature.
- generating awareness of the value and importance of the world’s plant species in sustainable development an for the global environment.
- aiding in the conservation of Argentine native plant diversity, and
- assisting botanical gardens and arboreta throughout Argentina, as living museums, to ensure that plants are recognized as the world’s greatest natural resource and that they are adequately managed for the future.

A botanic garden benefits not only the University where it is located, buy the city, the country and the whole world. The new Argentine constitution protects natural resources and guarantees

every inhabitant the right to live in healthy environments, that botanic gardens sponsor and protect.

Increasing degradation of the planet has caused preserved areas, national parks and botanic gardens to acquire unparalleled importance, not only environmental and scientific, but social and political.

Recently, by Provincial Law N° 8967, the Oro Verde Botanic Garden was included in the network of natural Protected Areas and put under the auspices of IUCN and UNESCO, as a result of which its importance has increased.

Ideally, botanic gardens, to fulfill their objectives, should accomplish “in situ” and “ex situ” plant conservation, especially regarding threatened species, as well as have an officially registered herbarium and an *Index Seminum* (a seed collection for international interchange). Both, an “in situ” garden and a seed collection, are being maintained at the Oro Verde Botanic Garden. A germplasm bank is also desirable and has been projected.

It is our aim to create an important research institute capable of sharing responsibilities with other gardens of the world regarding scientific, educational and social objectives.

The creation of a botanic garden also has political and cultural relevance, especially because the province of Entre Ríos has only one botanic garden (Oro Verde) designed and registered according to BGCI recommendations, that included a study of the number of potential visitors and its corporative image (items to be used and sold in the garden, created by fourteen teams of advanced students of the Graphic Design Faculty, Buenos Aires University).

The garden already has educational programs for pupils of different levels (Primary, Secondary and University students), and will certainly be useful to different sciences taught in the University, as well as to create an integrated circuit with a nearby national park.

Floristic diversity is very rich in the province of Entre Ríos and is considered second in importance after the north-west and north-east native forests, with about 2100 species of plants.

People have no knowledge at all about native plants uses. Similarly, botanists have little information about the biology and phenology of these plants. Therefore, it is absolutely necessary to teach about their importance as well as to create nurseries to investigate and preserve them.

Uncontrolled deforestation due to increasing agriculture demands the development of an important garden, not only to undertake research and education, but also to advise the government about laws to protect and rescue what is left of native vegetation in the country, especially to save threatened species “in situ” and “ex situ”, as well as to create seed banks.

The whole world accepts that sustainable development is the only solution to keep the planet alive, with plants as the main source of energy and life.

With the help of well known specialists in different branches of plants sciences that work in the Faculty of Agricultural Sciences of Entre Ríos National University, it is expected to develop a garden as an institute that will undertake conservation, research and education, in connection with the world garden network.

However, education on its own is not enough to achieve protection. To protect natural resources it is necessary to develop partnerships, not only including ecological groups, but all branches of production, as well as offering economic incentives to encourage sustainable development. Decrees banning the destruction of natural resources without stable government regulations to control its management have proved to be useless.

Argentina lost 70% of its native forests in the last 70 years. The Official National Census of 1935 made an inventory of 1.100.000 km<sup>2</sup> of the country covered with native forests. At the present time, according to the results displayed by the updated Official Forest Census of the National Secretary of Environment and Sustainable Development (2002), only 330.000 km<sup>2</sup> still exist, due to uncensored tree felling devoted mainly to favour the expansion of agriculture. The country wealth was not only derived from stockbreeding and agriculture but from natural resources that made us famous in the world. However, it has changed according to the results shown in official reports, giving a good account of destruction.

As it was mentioned, in 1935 39% of the nation was covered with native forests; nowadays it does not reach 12%. The diagnosis is striking and the reasons not too many. Not the whole population is to be blamed, but a handful of powerful men and companies willing to add more and more land to practise agriculture. One of the most terrible problems of the country is the disordered growth of deforestation. As no benefits are granted for farmers that respect sustainable development, tree felling expands day after day. However, although each province of the country has power to decide over its natural resources, the national government can promote legislation to assign territories of the country for different uses, but it is not put into practice. Right now, areas immensely rich in biodiversity are being destined to soybean production, regardless of how ephemeral its profits may be.

Not only biodiversity is being destroyed, but also important rural communities, cultures and ancient crops, and above all, unemployment has grown greatly leading to rural depopulation. Native forests are our primary wealth. Plant and animal biodiversity are absolutely rich regarding genetic, environmental and economic matters. Among other precious benefits, forests prevent soil erosion, great floods, droughts, climate changes, and what is most important, biodiversity takes shelter in them. The report warns that deforestation has led us to the loss of 40% of plant and animal species. Many trees are threatened with extinction, among others *Araucaria angustifolia* (pino Paraná) in the province of Misiones; *Tabebuia* spp. (lapachos), *Amburana cearensis* (palo trébol) and *Chenopodium* spp. (quinoas) in the NW jungles of the Yungas; *Bulnesia sarmientoi* (palo santo) and *Schinopsis* spp. (quebrachos colorados) in Chaco; *Fitzroya cupressoides* (alerce), *Austrocedrus chilensis* (ciprés de la cordillera) and *Araucaria araucana* (pehuén) in the South.

The view is distressing and it is not related to the past only. Each year big areas are deforested and daily, hundreds of denunciations are reported. Greenpeace denounced that natural reserves are being sold to grow soybean in the province of Salta. The most severely damaged zones are placed in the NW and NE of the country, as well as in the Chaco forests. One of the main consequences of deforestation is turning green areas into deserts. What is worse, when deforested land is destined to pastures, excessive grazing turns it into a desert. This is more notorious in the South. No regulations have been provided regarding forest management. Tree felling seems to be absolutely normal and once the land is degraded it is abandoned. Planning is a must, but reality shows a completely different view. Sustainable production is necessary and expected, but not at the expense of the remaining spots of natural life.

What is worse is the destruction of natural habitats for transgenic soybean production that is not even used for human nourishment in Argentina, but to feed cattle in developed countries, and the exportation of nutrients that will lead to soil exhaustion. Eighty per cent of natural reserves have no rules to preserve the ecosystems and protected species. Regulations are inefficient and disorganized. Various organizations have denounced lack of official to establish adequate control and sustainable strategies in the long term. The province of Entre Ríos is one of the most severely affected by hydric erosion and deforestation. In 2003 the Faculty of Agricultural Sciences of Entre Ríos National University began a research asked for by the provincial government to determine the remaining areas with native forests. The Teledetection and Image Processing Group of the Faculty and the Oro Verde Botanic Garden shared the research and showed by comparison with a previous report that in the last seven years over 600.000 hectares of native forests disappeared in the province. As a result of these dramatic conclusions the government sanctioned an emergency decree banning deforestation in all its territory.

Although severe penalties were established for its infringement, deforestation continued, as they were not put in practice. The present government abolished this decree, buy a legal appeal was presented by many ecological groups and won. After a long struggle an agreement was established between the provincial government, non governmental organizations and agricultural entities. It was decided that properties with well cared for native forests in the province would be free of tax up to a maximum 300 ha. Although recently applied, it seems to be a better policy than banning deforestation or simply trusting in education. The efforts of Non Governmental Organizations and Botanic Garden need the government support, otherwise they are useless.

The Oro Verde Botanic Garden was asked to present a detailed report of the reasons for preserving native forests that were taken into account by the examining magistrates. The future of these new announcements is perhaps the most unknown question. We had 105 million hectares of native forests in the country. Today there are 33 million hectares. In between there are only 70 years. It is clear that there in no time to waste.

## **Biography**

**Muñoz, Juan de Dios:** Agricultural Engineer; Doctor of Pharmacobotany and Pharmacognosy (University of Buenos Aires); Professor of Botany and Director of the Oro Verde Botanic Garden in the Faculty of Agricultural Sciences, Paraná, Entre Ríos National University, Argentina.