



## Tropentag 2012, Göttingen, Germany September 19-21, 2012

Conference on International Research on Food Security, Natural Resource  
Management and Rural Development organised by:  
Georg-August Universität Göttingen and University of Kassel-Witzenhausen

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### **Tree Seed Procurement in Loja, Ecuador, Including a Concept for a Regional Tree Seed Program**

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#### **Introduction**

South America hosts 22% of the world's forests with its unique biological diversity. Among all South American countries Ecuador is considered being the country with the highest biodiversity, but unsustainable land use and forestry practices threaten this diversity. Up to today Ecuador has the highest deforestation rate of the South American continent. To counteract the forest losses wide-ranged reforestation has to take place but is still at the beginning. The reforestation efforts up to now do not compensate the high losses in forest cover. 90% (3500ha) of the annual reforestation in Ecuador is taking place in the Andean region (FAO 2006, 2011).

A common tool to reinstall the forest cover is by planting. So far 140,000 ha of forest plantations exist in the Andes of Ecuador and the commonly used species are *Eucalyptus globulus*, *Pinus radiata* and *Pinus patula*. Just recently Ecuadorian organizations paid particular attention to tree species native to Ecuador and their reforestation potential. The major obstacle to use native species on a larger scale for reforestation is the lack of adequate knowledge about their physiological and silvicultural traits. Information about appropriate seed storage, propagation methods and silvicultural treatment options has to be acquired, applied and its experience communicated. To extend the local knowledge about seed handling of native tree species an evaluation of the current seed procurement methods for native tree species in local tree nurseries has to be carried out. And the results have to be used to design a Regional Tree Seed Programme. This was done in the study at hand for the Province of Loja, Ecuador.

#### **Material and Methods**

The field research took place in the Province of Loja, the most southern province of the Republic of Ecuador and was conducted during a period of three month (September to December) in 2011. The overall research question of the study was:

1. Are there areas of improvement in the current management process of tree seeds in the Province of Loja?

To answer the research question two major activities were carried out

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- a) Evaluation of the provincial tree nurseries' current seed procurement & management methods for native tree species.
- b) Development of an improved concept for sustainable tree seed supply for the Province of Loja which is practicable and well adapted to the local circumstances.

The needed data for the study were gathered by applying primary data collection techniques such as questionnaire survey, structured observation, interviews and conversations with key-informants. Primary data collection techniques were chosen in order to gather qualitative data reflecting on the current circumstances in the regional tree nurseries and their actual seed management practices. In total 22 nurseries were surveyed. Out of those 15 work in cooperation with the Gobierno Provincial de Loja (GPL), the regional government. To get a greater picture of existing nurseries in the province and the neighboring province Zamora-Chinchipe another seven nurseries were visited and evaluated. Those seven nurseries are managed either by municipalities, universities or PROFORESTAL. From the 22 surveyed nurseries 15 nurseries (within the Provinces of Loja and Zamora-Chinchipe) were visited and structured observation of the nurseries compounds was carried out. Through the questionnaire survey and the structured observations most of data about the tree nurseries and their seed management was collected. Expert interviews and key-informant conversations were used to validate the gathered information and to gain a deeper knowledge about the current situation in the field of seed management.

To be able to evaluate the recent performance of the nurseries a numeric efficiency ranking on



the base of existing literature about best practices in small and medium scale tree nurseries was carried out. The numeric ranking (divided into four categories [Infrastructure, Documentation, Workforce & Seed handling]) serves the purpose to picture the given situation in a clear and demonstrative manner. To the knowledge of the author, a systematic evaluation of nursery practices in Southern Ecuador was not done before and the ranking might serve as an example on

how to monitor nursery practices in the future.

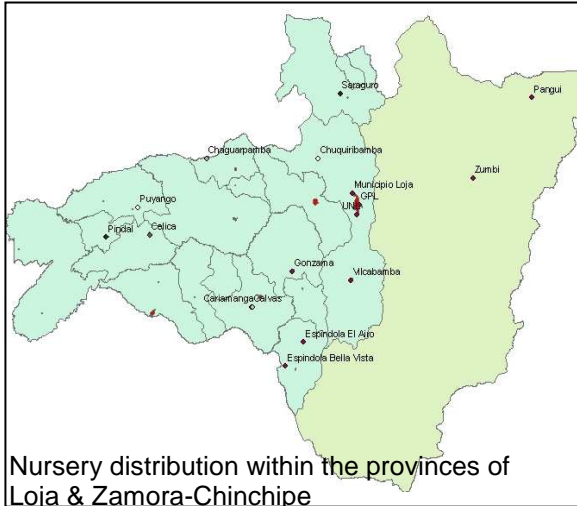
In Addition national and regional forestry strategies and plans were revised to understand the encountered situation. The “Planificación Estratégica Plantaciones forestales” and the “Planificación Estratégica Bosques Nativos” (Ministerio del Ambiente 2007a & 2007b) were analyzed to have a better inside into the national strategies and future plans. By studying the “Diagnostico Forestal” and the “Plan Forestal de la Provincia de Loja” (Gobierno Provincial Loja 2006a & 2006b) regional circumstances were further revealed. It got clear that a lot of effort was put into sound reforestation plans by the Ecuadorian government but almost no thoughts have been directed towards a proper seed management, neither on national nor on regional level.

All these information and the model of DANIDAs national tree seed programme framework (Graudal 1998, Graudal et. al 1997) was used to develop a regional seed programme for the

Province of Loja, which assesses the main areas of improvement of seed management and highlights facts in need for special consideration.

## Results and Discussion

The nurseries are located within an altitudinal range from 752m to 3184m a.s.l. and the natural conditions throughout the province are highly variable – from very dry climates to very humid regions. The smallest nurseries have a surface area between 154 and 210m<sup>2</sup>. The biggest nurseries have an extension between 10.000 and 24.500m<sup>2</sup>.

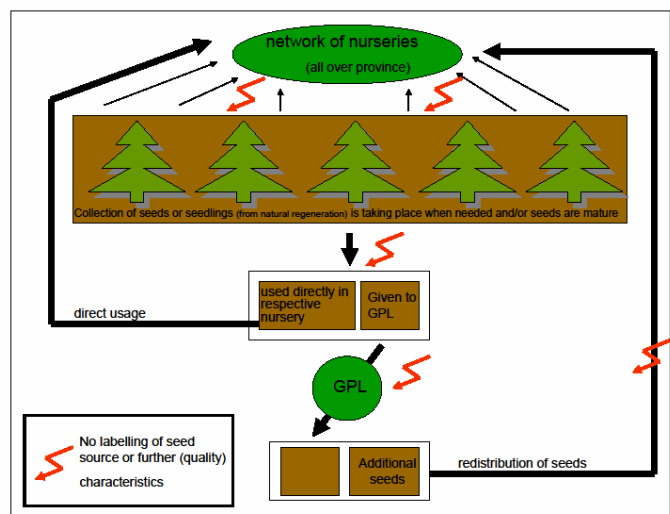


Nursery distribution within the provinces of Loja & Zamora-Chinchipe

In general it can be said that the encountered conditions of the surveyed nurseries vary essentially. Not just the external factors such as surface area and altitudinal range are highly different, also the annual production capacities as well as the actual number of plants produced per year are very different among the nurseries.

The basic infrastructure exists and is similar in all nurseries. The major infrastructural drawbacks are insufficient fencing around the nursery compound to prevent robbery, inadequate water supply and missing land titles. Those insufficiencies are characteristic for the situation on site and contribute to an inefficient nursery-performance. With an average of 4, 7 employees per nursery the workforce is relatively small and additional tasks such as collection of high quality seeds from further away can not be conducted. Besides frequent vocational trainings for the nursery staff are not hold and therefore further knowledge about e.g. pest control is not reaching the nurseries.

The most frequently used seed sources are in immediate proximity to the nurseries. Qualitative or more diverse seed sources which are further away from the nurseries are not explored for reasons of lack of transportation means and workforce-shortage. If seeds from the national market are used they mainly origin from neighboring provinces (Zamora-Chinchipe or El Oro). The graph demonstrates the current seed distribution practice. At no time any sort of documentation (of collection site or date and germination rate, etc.) is carried out. The techniques of seed source selection, harvesting and verification of seed quality are all very simple and mainly based on observation of physical traits.



Concerning the Regional Tree Seed Program (RTSP) the following findings were made. The public budget is very limited and already pre-assigned to different fields of activities; forestry related activities just being one of them. The RTSP has to consider this focus and team up with the efforts of the regional government (GPL) to benefit from it and not to counteract. For example it is possible to establish new seed sources within existing focal areas (in this case catchment areas) to increase the warranty of the RTSP. Utilization pressure is high on the ecosystems and degradation is progressing quickly which also results in an ongoing decrease of native species and reduces potential sites suitable as seed sources. Therefore it is important to engage fast and to use the already existing organizational structures such as the network of nurseries run by the GPL, the potential of the local universities for scientific contributions and NGOs to take over normative activities of the RTSP.

## **Conclusions and Outlook**

Based on the efficiency ranking the performance of the regional nurseries are efficient in the field of infrastructure, moderately efficient in the fields of workforce and seed handling but hardly efficient when it comes to documentation. This indicates how important and promising the implementation of a RTSP in the Province of Loja is. The RTSP focuses exactly on the areas of improvement and engages in activities, both productive and normative, to develop a sound seed management system for native tree species within the province.

By doing so it is important to engage in productive activities such as selection, establishment implementation, management and conservation of high quality seed sources, and normative activities such as implementation of standards for seed quality testing, development of a seed certification system and a sound documentation system. During all those tasks the participation of the regional government (GPL) and local institutions is of crucial importance for the success of the RTSP.

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