



ECUADOR BAMBOO INITIATIVE

Background: Bamboos are giant, fast-growing, woody grasses with a wide distribution in both tropical and subtropical climates. Sixty to ninety genera and some 1,000-1,500 species of bamboo are estimated to exist in the world, growing up to about 40 feet tall and up to 12 inches in diameter. New shoots (culms) can grow up to several feet per day, and achieve maturity and maximum strength in only three to four years. But for all of bamboo's attributes it is a resource that has been neglected, and worse, considered a weed, only a "poor man's" material and treated as such. What had once been an abundant supply, readily available to its users, is now becoming harder to find. Indiscriminate cutting and poor management of the "manchas" (stands of bamboo) have left vast areas degraded and the availability of bamboo in the market erratic. But this situation is now beginning to change.

While bamboos have been used by human beings all around the world for thousands of years, the plant's potential to substitute for slower-growing wood species in a vast number of modern commercial uses has only recently been recognized and the development of applications and markets is receiving increasing emphasis. It is widely used for housing construction and other well-known traditional uses including scaffolding, furniture, bridging, fencing, food for human consumption and cooking fuel. Pound for pound, laminated bamboo has been found to be stiffer than soft steel, and it is also harder surfaced than either fiberglass or red oak. As a result, a wide range of non-traditional new uses are being developed, ranging from parquet flooring to surfboards, from boat hulls and other large engineered structures to buildings, towers, and bridge components. Bamboo is also increasingly being used to substitute for wood pulp in the production of paper (about 2.2 million tons annually in India today), as a component of particleboard, and as a renewable fuel for power generation.

Easy to establish, adaptable and quick-growing, bamboo is an ideal reforestation plant to check soil erosion and re-establish habitat for a large number of insects, birds and animals. Bamboo is comparable to other forest species in its ability to fix carbon from the air, estimated at about 4,000 pounds of carbon per hectare per year. A growing number of both developed and developing nations – ranging from India to Colombia, Guatemala and Australia – are establishing commercial and smallholder bamboo plantations to reclaim degraded areas and generate employment in a growing number of bamboo-based rural and urban industries. Ecuador is just beginning to recognize and apply its considerable bamboo resources.

The Situation in Ecuador: Bamboo is a natural resource that has played an important role in Ecuador for centuries. The pre-Columbian record includes pottery that represents bamboo dwellings from 3,500 B.C. The houses of the Real Alto site of the Valdivia culture had walls of “bahareque”, a construction system made of bamboo culms, clay and straw, a method still in use today. The varieties of bamboo in Ecuador, especially *Guadua angustifolia* and *Guadua weberbauerii*, are especially useful for housing construction because of their strength, size and availability. Machinations on these bamboo species in Colombia have quantitatively measured these characteristics.

During the next 25 years, cities in developing countries will account for nearly 95 percent of total world population growth. World Bank and UN data suggest that the urban population of Ecuador will more than double between 1995-2025, while the rural population will actually decline by nine percent during the same period. Informal settlements will continue to grow at an ever-increasing pace as families continue to move to the cities of Ecuador, especially Guayaquil. This will bring together what was once dispersed rural poverty and concentrate large segments of the population in extremely vulnerable informal settlements, foster the exploitation of the surrounding natural and water resources and exacerbate an already overburdened governance structure in its ability to manage a sound, safe, and productive environment.

Traditionally widespread in rural areas and in transitional informal settlements on the outskirts of large cities, bamboo’s positive qualities of low cost and durability have also been recognized by Hogar de Cristo, a Catholic NGO that builds starter house kits that are made available to the poor along the coast of Ecuador for as little as US\$385 per unit. Architects in Colombia and Ecuador are reporting on bamboo’s earthquake resistance and are seeing it as a material with tremendous design potential and NOT just a poor man’s material. Work carried out in the Armenia, Colombia earthquake reconstruction programs has produced earthquake-resistant designs, construction methods, and the first-ever national building code that recognizes bamboo as a legitimate building material. This code is serving as a model for similar work being done in Ecuador.

The shelter solution that is now most commonly used within informal communities in Ecuador’s coastal and jungle regions is a precarious bamboo shelter that barely keeps the rain out. But even this solution is one built on uncertainty, as existing natural stands of bamboo continue to be over-cut and slopes, riverbanks, and water-sheds are degraded. It is essential that the supply of bamboo first be stabilized, and then significantly augmented through bamboo forest regeneration that will supply the future needs for thousands of newly established urban families. In order to address the needs of the various communities, the basic Hogar de Cristo design must also be improved to accommodate the demands of a disaster prone environment. Despite significant environmental degradation, seismic and flood hazard risks, and obvious need to develop the bamboo resources of Ecuador, there has been minimal attention and investment made available to upgrade the use and supply of bamboo.

Proposed Project Area: The eastern region of Ecuador and its cities of Coca and Lago Agrio, the Chocó–Darién forests and the Guayas river basin, especially the Guayaquil metropolitan region and its hinterland.

Roughly 40 percent of the population of Guayaquil lives in unauthorized, poorly-constructed housing, with low levels of urban services (eg., sewage disposal, refuse collection, water and electric availability, etc.). In addition to urban-based environmental problems, there is also extreme deforestation in the Guayas River basin and the peri-urban areas that surround the city.

This condition is typical of the towns and cities all along Ecuador's coast. The degraded landscape is losing its ability to contribute materials for shelter and industrial products. This, in turn, contributes to the vulnerability of urban and rural areas and ignores the potential of the natural resource base to contribute to economic development at the national and local levels.

Guayaquil is one of the most seismically-active urban areas in Latin America, and is one of nine cities in the world included in the UN RADIUS (Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters) project. Most of the population is extremely vulnerable

because of the poor quality of building construction and the lack of effective land use management practices. As part of the RADIUS project work, researchers concluded that a large earthquake could result in 26,000 deaths and 53,000 serious injuries. The city is also prone to flooding due to a degraded landscape, poor watershed management, location in/near flood plains, and poor land use management practices.

Proposed Objectives: Improve the supply and use of bamboo in Ecuador to: 1) improve degraded natural environments in the Northeast Oriente Region, the Chocó-Darién Region and the Guayas River Basin through bamboo forest landscape restoration; 2) through shelter construction and improvement programs using bamboo in informal settlements on Ecuador's Pacific coast, especially in Guayaquil and other key cities in the Oriente; 3) reduce the impacts associated with natural hazards (flooding and earthquakes); 4) increase livelihood potential through the development of the supply of bamboo, bamboo products and their commercialization; and, 5) begin the process of certifying working forests restored with bamboo by the Forest Stewardship Council.

Proposed Strategy/Actions: Bamboo's multi-purpose qualities will be promoted as a seismically-resistant building material and small, medium- and large-scale plantations will be established to increase the supply of bamboo to the market. Other activities will expand on initial successful efforts to develop value-added industries using bamboo as the prime material.

1. Finance and technical assistance to support planting of bamboo, primarily at demonstration sites in the Northeast Oriente region, the Chocó-Darién region and in the Guayas river basin, with small, medium and large farmers having the land and ability to establish bamboo as a cash crop on restored working forests. Marginal private and public lands in areas threatened by erosion or flooding may also be brought into production through the negotiation of long-term concessions with private growers. The establishment of a bamboo nursery and a restored working forest will serve as a model unit for developing similar facilities throughout Ecuador. The establishment and management of the nursery and working forests will be achieved and this infrastructure will be audited by an FSC (Forest Stewardship Council) approved body in order to ensure that sustainable forest management is practiced. Currently, FSC precedence has been set in Ecuador with the FSC-accredited Smartwood certifying the first bamboo plantation forests in the Guayas river basin. The certification process for the working forests will work in collaboration with both Smartwood and the certified plantation, Reysahiwal.

2. Home construction and home improvement programs in informal communities, to be prepared with local government, NGOs and the private sector at a scale that will upgrade informal settlement, civic and domestic bamboo structures through seismic- and flood-resistant improvements. With the vast quantity of existing informal settlements built of bamboo in a non-seismic resistant manner, it is essential that these initial structures be upgraded through a program of home improvements. This program will design and train local NGOs to implement such a system of home improvements.

3. Collaborate with NGOs like Hogar de Cristo and private builders – both commercial and community-based – trained in bamboo construction. This collaboration will guarantee an adequate supply of bamboo building materials as housing construction programs expand in an effort to meet the swelling demands generated by the massive urbanization process of the next two decades. Work carried out in the Armenia, Colombia earthquake reconstruction programs now underway produced the first-ever national building code that recognizes bamboo as a legitimate building material and serves as a model for Ecuador. This program will help establish a similar working code in Ecuador.

4. Natural Hazard Impact Reduction Programs, will be comprised of seismic hazard reduction activities, including: a) the identification and mapping of high-risk areas within selected communities; b) the design and promotion of training and curriculum modules to increase seismic hazard awareness among school children, the general public, and public officials; c) development of building and land use codes and demonstration projects which reflect seismic hazard concerns; and d) training of construction industry workers in seismic-resistant design. Shelter and community infrastructure improvement programs will build on and improve the local building materials supply and traditional construction systems.

5. Flood hazard reduction activities, including the identification and mapping of flood-prone areas the Northeast Oriente Region, in the Chocó-Darién region and in the Guayas River Basin; the design and promotion of community-based flood early warning and evacuation plans; promotion of community-based services management to manage waterways (eg., refuse collection and disposal, drainage way cleaning and maintenance, etc.), and the improvement of degraded environments in watersheds through the development of bamboo forest restoration plans. Planting bamboo is a proven erosion control and soils retention method. Specialized entities and local private and community groups are stepping forward to voice their interest in and willingness to reforest denuded areas and river banks to both reduce flood hazards and improve the environment and the existing shelter stock through business opportunities.

6. Livelihoods promotion activities, will spread economic impacts beyond construction to include the manufacture of value-added bamboo products, urban agriculture, forestry, and watershed/environmental management activities in high-risk earthquake- and flood-prone areas. In the deteriorating economic environment through which Ecuador is passing local leadership has taken a critical look at available, local resources that can contribute to economic and environmental recovery. Bamboo is widely available in the region and has been the focus of recent seminars and workshops that have focused on the potential of bamboo to address shelter, economic and environmental needs. Bamboo products firms have come onto the market and have begun to transform the image of the material from one of a “poor man’s material” to one that is contemporary and highly marketable.

7. Maintain and Increase Carbon Stocks. Bamboo accumulates biomass quickly and offers the opportunity to maintain and increase carbon stocks through carbon sequestration (one hectare of bamboo forest can absorb 17 metric tons of carbon/year). As long as it is not burnt, and is instead used for durable products, the absorbed carbon will remain fixed as long as the product lasts. This carbon sink potential of bamboo therefore makes sustainable bamboo forests and, in some cases, their extracted products viable candidates for the carbon offsets market. For example the blending of 50% bamboo fibers in the creation of cement board can actually offset the carbon emissions associated with the cement production._

Potential Implementing Partners.

In the US:

- Darron Collins, of the World Wildlife Fund for Nature (WWF) Latin American and Caribbean Secretariat based in Washington, will contribute human and financial resources and technical backstopping. As forest landscape restoration is third target of the WWF's forestry program, the development of sustainable nurseries and restored working bamboo forests will be their focus. The WWF LAC Secretariat will also help bring FSC-based certification to the restored, working landscapes.
- Oscar Hidalgo, bamboo expert, will provide time and technical assistance in the area of bamboo cultivation and use of bamboo.
- The Office of Foreign Disaster Assistance/USAID (OFDA) will provide financial resources and technical advice on the disaster mitigation component of the project.
- Earl Kessler, of PADCO, will provide time and technical expertise in the area of building codes, urban planning, and bamboo-based architecture.
- Philip Rourk, of AGInternational, will provide time and technical expertise in the area of project finance and small business development.

In Ecuador:

- Collaborating with the WWF LAC Secretariat, the WWF associate Fundación Natura and the WWF Colombia Program Office will help establish the reference ecosystem and help establish the model nursery and bamboo working forest.
- In the Oriente, the Camara de Agricultura is actively engaged in seeking support for their program of bamboo cultivation and commercialization. In the Government of Ecuador, The Unidad de Desarrollo Norte, of the Oficina de la Presidencia de la Republica and La Oficina de Proyectos Especiales Del Ministerio de Desarrollo Urbano y Vivienda have expressed interest.
- In the Guayas River Basin, the potential partners include Hogar de Cristo, ECUABAMBU, INBAR, and local governments. ECUABAMBU in Guayaquil and the Hogar de Cristo are two entities that have demonstrated their capacity to work with local governments on issues that range from reconstruction to mitigation and from watershed management to shelter. The role of the provincial and local government is key to achieving results. The activist local governments of the recent past have made Guayaquil a considerably better place to live. The local governments have the political will and interest to reduce the vulnerability of Guayaquil to natural disasters and improve its disaster preparedness. Local and regional expertise will support these program activities to achieve the short, medium and long-term results sought. The recent Seminar on Bamboo and its role in disaster mitigation sponsored by Ecuabambu and INBAR attracted over 400 individuals representing the range of interests and expertise available. There is great interest in local applications of bamboo in an integrated program of improvement in the mitigation of disasters and upgrading the environment to support sustainable economic growth.

Primary Outcomes: The primary outcomes expected to be achieved through this program include; degraded environments improved, natural disaster impacts reduced, informal community infrastructure and shelter improved, and enhanced livelihood potential developed.

An illustrative set of outcomes is presented below. This illustrative set of outcomes will be reviewed during project preparation to be carried out to verify that similar work has not already been accomplished and that this programs' efforts coordinate with activities that advance its agenda.

1. A program to improve degraded environments through forest landscape restoration in the Northeast Oriente region, the Chocó-Darién region and the Guayas River Basin. The development of three forest landscape restoration management plans and fundraising schedules – one each for the Chocó-Darién, the Northern Andes, and the Napo region. The ecological goals of these plans are to regain ecosystem health in areas denuded of forests, restore hydrological patterns, build populations of soil fungi, foster diversity of natural soil flora and fauna. The placement of these activities will be directed at restoring corridors between and establishing buffer zones around already established protected areas. These restored areas will ultimately form the working bamboo forests that will supply an expanding market for processed bamboo products.
2. A home improvement program action plan to upgrade the provisional shelters so vulnerable to flood and earthquake in the Oriente and the Guayas River Basin, especially in Guayaquil's informal settlements to make them more disaster resistant.
3. A Bamboo Products Development Service comprised of private sector entities now actively engaged in bamboo product development.
4. A user-friendly image database apt for local government and community groups to prepare and update local disaster mitigation plans, to support dissemination programs and advocacy work, to document program development and to support scaling-up pilot efforts this program will support.
5. A training module and advanced degree curriculum on disaster mitigation and resistant construction techniques in local universities and a training schedule in place to offer short and long term awareness courses and improvement programs to implement.
6. A clear set of responsibilities, responses and resources for local and provincial entities to respond to disasters and to work towards their mitigation.
7. A greenhouse gas emissions inventory on the agro-ecosystem to determine the baseline of the carbon sink capacity of a bamboo plantation. This will result in working with a greenhouse gas broker to sell offsets in the marketplace.
8. Increased area of restored, working bamboo forests certified by an FSC-accredited auditing body.
9. The organization and capitalization of a small equity and loan fund, perhaps on the order of US\$15 million in size, which would serve to co-finance – along with commercial banks and local financial PVOs – new or expanded ventures undertaken by small, medium and large farmers and entrepreneurs to plant bamboo, build with bamboo, or develop and market other value-added applications utilizing the material. Specialized technical assistance will also be provided to participating businesses, both at the establishment of new ventures and to monitor progress during loan repayment periods.

The Bamboo Fund would provide up to 50% of outside financing provided by banks or financial PVOs, either as quasi-equity or as medium and long-term loans. Participating banks and financial PVOs will provide at least the other 50% of outside financing, that is at least another \$15 million, while the projects' sponsors – small growers, cooperatives, larger farmers, builders and manufacturers – will be required to invest their own equity to cover at least 25% of total project costs. Thus, it is estimated that the fund should be able to generate on the order of \$40 million in total new investment in the production and processing of bamboo over a three year period, enough – were it to be invested solely in establishing or extending bamboo plantations – to finance the costs of establishing about 20,000 hectares of bamboo grove, a large enough area to demonstrate both bamboo's economic and environmental potentials.

Fees charged at origination will cover the cost of technical assistance needed to develop and launch new investment projects, while a small interest surcharge will support the cost of monitoring and supervision. Local and international NGOs such as ECUABAMBU and INBAR will be important sources of expertise and management in the provision of the technical assistance required. Although exact numbers need to be more carefully analyzed during the course of detailed project design, for purposes of illustration it can be calculated that a 3.0% upfront fee at origination, applied to the fund's \$15 million dollar portfolio and financed as part of total project costs, would generate \$450,000 towards the reimbursement of upfront project development and appraisal costs. A one percent interest surcharge would generate a further \$150,000 annually, which would perhaps be sufficient to cover the expenses of portfolio monitoring and supervision, and ongoing coordination with other project implementing agencies.

Outputs: Detailed project design
 Institutional commitments from local NGOs, business and government participants
 Business plan/information memorandum suitable for raising financing from international agencies