4.6 Commercial bamboo plantations as a tool for restoring landscapes

ECOPLANET BAMBOO

Introduction

Converting degraded and marginal land into commercial plantations of bamboo[1] can restore canopy cover, connect remnant forest patches and their associated biodiversity, reduce soil erosion and stabilize water tables. It can also provide revenue and alternative livelihoods for surrounding communities. Selective harvesting focuses on the removal of individual poles or culms from each bamboo plant, ensuring that canopy cover and carbon storage is continuous and avoiding the need to replant. Bamboo's complex but shallow root structure restores compacted soils and improves water filtration.

Bamboo can also provide an alternative fibre to wood in the use of engineered timber products, pulp and paper, charcoal and bioenergy, thereby reducing pressure on natural forests.

Although bamboo is an ancient crop in China, with many benefits, its use as an alternative fiber has had limited success until recently. Technological barriers to silviculture and processing, limited investment into research and development, and a lack of planting material have been the causes.

BAMBOO CAN BE USED TO RESTORE LANDSCAPES AND PROVIDE AN ALTERNATIVE TO TIMBER.

Yet these barriers have been an environmental blessing. A global framework for the industrialization of bamboo has been established that ensures that it is grown commercially only as a deforestation-free crop, and on degraded land so that it does not compete with food production. Legislation and policies are starting to be written at the country level,[2] and a certification standard is being designed[3] to ensure that project managers use best practices, for circumstances where existing standards such as the Forest Stewardship Council (FSC) do not apply.

The founders of EcoPlanet Bamboo[4] realized that supply and demand, and the world's ever-increasing appetite for timber were, for the most part, being excluded from the

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EcoPlanet Bamboo is a privately held U.S.-based owner and developer of commercial bamboo plantations. It is based in Chicago.

context of REDD+ initiatives. EcoPlanet aims to prove that commercial plantations of bamboo can be developed on land that meets strict environmental criteria, and can provide a sustainable alternative fibre to meet the growing global demand. With more than US$ 50 million committed, EcoPlanet Bamboo set out to show that bamboo can be an economically viable part of large-scale landscape restoration, with positive social and environmental impacts.

Successful case studies

Nicaragua

EcoPlanet Bamboo began operating in Nicaragua in 2011. The project uses *Guadua aculeata*, a native species of giant clumping bamboo that occurs naturally within the forest, to restore 6,500 hectares (ha) of highly degraded land into commercial plantations and provide more than 250 permanent jobs. An additional 600 ha of remnant patches of tropical forest have been conserved, resulting in habitat connectivity and a more diverse ecosystem. Another 1,000 ha is undergoing restoration.

Located within the semi-autonomous Southern Atlantic State of Nicaragua's Caribbean coast, the project targets an area that has seen considerable large-scale deforestation.

In one of EcoPlanet Bamboo's farms, deforestation and degradation have resulted in a mosaic landscape; scattered patches of remaining forest are interspersed with grasslands where the soil is compacted in many places. High levels of poverty combined with the extreme damage to the landscape mean that these areas are unlikely to regenerate without human assistance. Few species can survive in the compacted clay soil, which is leached of nutrients, or adapt to the heavy and frequent rainfall of the tropical climate.

Guadua aculeata, which shows mass flowering every 80 or more years, flowered in Nicaragua during 2009–11. This allowed EcoPlanet Bamboo to use native seed, adapted to local conditions, in its plantations. Only land that was under private ownership was included in the project area. No ripping of the land occurred, and existing trees were left in place to provide additional biodiversity benefits, with the bamboo planted among them. This diverse mix supports the restoration of a semi-native forest ecosystem, and restores much of the biodiversity originally found in the area.[5]

Stringent certification standards were applied on these plantations, ensuring that sustainability criteria were built into the operations from the onset. The plantations were certified under several schemes, despite the high capital costs and the costs associated with annual audits, in order to set a benchmark for bamboo plantations globally. Carbon validation and verification has occurred under the Verified Carbon Standard (VCS) in combination with gold-level Climate, Community and Biodiversity Alliance (CCBA). Forest management certification by the Forest Stewardship Council (FSC) ensures that the plantations are responsibly managed.

South Africa

In 2012 EcoPlanet Bamboo used a different model in South Africa's Eastern Cape. There, the restoration of 480 ha of land that was depleted by over a century of chemically intensive pineapple farming, focused on the regeneration of exhausted agricultural soils. The project also stimulated local economies by providing an alternative fibre for international carbon and charcoal markets.

Bamboo is not part of the natural forest matrix in the country and isn't recognized as a forest species. In South Africa, as elsewhere, this poses a number of policy challenges. It is unclear whether bamboo plantations should be under the jurisdiction of the Ministry of Forestry, the Ministry of Agriculture or some other entity. The ecology and growth patterns of bamboo are those of a grass, and yet a grove of giant bamboos, more than 30 metres tall and with diameters not dissimilar to trees, have some of the characteristics of a forest. Furthermore, bamboo provides a fibre that is similar to wood.

In South Africa, giant bamboo, including *Bambusa balcooa*, EcoPlanet Bamboo's species of choice, was introduced in the 1920s to develop a domestic paper industry. Subsequently, farmers frequently planted them alongside natural vegetation, and today they are found in clumps across the landscape of the Eastern Cape. Although patches of native riparian vegetation are still intact, the project areas in South Africa differ from those in Nicaragua. They host no standing trees, and even after more than five years of laying fallow following pineapple cultivation there are few signs of ecosystem regeneration. Blocks of bamboo are planted in a mosaic alongside existing wildlife corridors and native vegetation.

The South African case is the first example in the world of large-scale restoration using tissue culture plantlets[6] to overcome a lack of planting material. The lack of restoration projects that used tissue culture plantlets had been a major barrier to the industrialization of bamboo outside of China. EcoPlanet Bamboo invested heavily in the technical science behind the laboratory development of plantlets at a commercial scale and in ensuring their transition and survival in a landscape setting. The project has restored 345 ha of highly degraded land, preserved more than 140 ha of wildlife corridors and native vegetation, and created approximately 100 jobs in an area that has suffered severe unemployment since the crash of South Africa's pineapple industry.

What does successful restoration mean?

To be successful, landscape-level initiatives must restore an ecosystem to a fully functioning state. This results in intact water and carbon cycles, healthy soils and flourishing biodiversity.

Giant bamboo is able to facilitate such restoration in a number of ways. The root system of clumping bamboo does not spread beyond the centre of the plant; it forms an intricate network that has the ability to break up compacted soils and restore permeability and aeration. It also slows the flow of water through the layers of soil.

Each individual clump puts up multiple stems or culms each year. These break through the soil and create a multi-dimensional structure, providing habitat for a range of insects, birds and mammals. The giant culms and their associated root system also form a considerable carbon reserve. As the bamboo clumps develop they begin to shed large volumes of leaves, which form a litter layer that is protected by the canopy. These leaves decompose and increase the organic content of the soil and the associated soil carbon.

The critical aspects of the ecosystem are controlled and regulated, enabling other species to grow and thrive. The growth pattern of bamboo means that the removal of individual culms from each plant does not harm the ecosystem. In contrast, it stimulates further growth, since in a well managed stand, the removal of mature material frees up space and resources, which in turn stimulates the faster and more frequent emergence of new culms. That makes it a fully renewable resource.

Overcoming barriers

Both case studies are examples of restoration at the landscape level that meets stringent economic, environmental and social objectives and overcomes the barriers associated with forest restoration that are listed below.

Lack of access to capital

Restoration efforts often focus on planting native species, but fail to provide the funds for the long-term efforts required for ecosystems to become self regenerating. Tree plantations also require long-term capital.

EcoPlanet Bamboo's model overcomes these capital requirements in two ways. Carbon finance provides funds in the early years. Significant volumes of atmospheric CO_2 are absorbed and transformed into woody biomass between years four and eight, which is also the time when financial requirements are highest, due to accumulated debt. The Nicaraguan project has been validated by the VCS for approximately 1.5 million tonnes of CO_2 removal. Access to carbon finance also dictates that only land that meets strict eligibility criteria is accepted for inclusion, ensuring that the bamboo itself does not degrade the land.

Political risk insurance[7] was also significant in overcoming many of the barriers in regions that have a high perceived risk from a capital perspective. Access to such

insurance protects the investments raised for restoration efforts, and encourages additional project development.

Insecure land tenure and associated ownership rights

Insecure land tenure and resource ownership often causes restoration efforts to fail. In many areas trees represent income and a source of fuel, which often leads to conflicts about ownership or use rights. These in turn threaten the success of ecosystem restoration.

Traditionally, some large international environmental NGOs have been opposed to private land ownership of environmental initiatives. However, in both Nicaragua and South Africa owning the land was fundamental to EcoPlanet Bamboo's ability to raise money for species that had not been grown in a commercial setting, and in countries with high perceived risks. Ownership allowed investment to be guaranteed against the land and facilitated the ability to scale up restoration efforts.

Lack of clear land tenure and secure ownership rights are limiting factors as EcoPlanet Bamboo selects suitable countries for new projects. Improvements to legislation and policy within countries seeking restoration efforts can assist in the facilitation of such projects.

Drivers of deforestation

Without addressing the underlying drivers of deforestation and land-use change, it is unlikely that restoration efforts will succeed. EcoPlanet Bamboo's approach chooses areas where deforestation can be curbed by improving livelihoods and by eliminating unsustainable practices through the empowerment of local communities and the provision of alternative livelihood options.

Commercial plantations versus a smallholder model

As listed below, there are many reasons why a smallholder model is unlikely to be successful at the scale required to achieve restoration at the landscape level, provide fibre and resource security, and establish a commercially viable initiative.

High capital requirements

Although bamboo is a fast-growing plant, the provision of commercial-diameter culms requires an initial seven-year period of high capital requirements, particularly when the bamboo is grown on degraded land. This is likely to be too long for smallholders and is a reason for the lack of success of small-scale bamboo projects.

Logistics

Transportation of raw bamboo is key to the success of initiatives in remote rural areas. Drying and pre-processing is necessary in order to reduce costs and facilitate

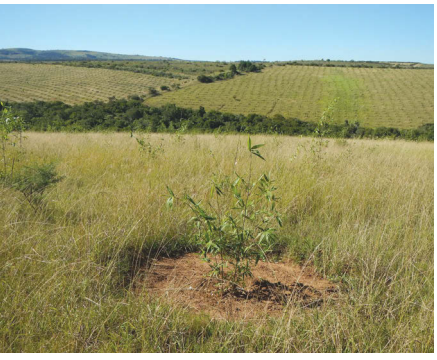
transportation. In a smallholder model, where individual plots are usually located at a distance from each other, it is likely that the costs of transportation, combined with the labour required, would make bamboo an unattractive option for such farmers.

Standardization, quality and security of supply

For major industries to shift to bamboo as an alternative fiber, the supply must be secure. Like any other crop, bamboo requires considerable inputs and management to be produced commercially. The level of these inputs affects productivity and the quality of the fiber. A smallholder model is unlikely to be able to provide enough high-quality resource for a large-scale industry, and lower levels of processing (such as handicrafts) cannot sustain the costs associated with production. The social and community aspects of EcoPlanet Bamboo's model have focused heavily on job creation in areas with few opportunities for secure and attractive jobs. It also focuses on empowerment of women and the provision of services, including health care and education.

Scaling up restoration

Scaling up restoration efforts to the level necessary to achieve a significant global impact requires a shift in approach from NGOs to the private sector. EcoPlanet Bamboo's model proves that maximizing social and environmental impact does not come at the expense of profits, but in fact is at the core of such profits. The non-profit and public sectors can make a significant contribution to large-scale restoration, however, and to a shift from unsustainable sources of wood to bamboo as an alternative fibre. Identification of suitable regions, policy and governance work, ensuring the security of land tenure, and the provision of low-cost capital could all lead to further expansion of such projects.



EcoPlanet Bamboo's experiences in Nicaragua and South Africa have provided lessons for larger-scale (40,000-ha) projects to regenerate degraded land into commercially viable plantations that are fully integrated into the forest matrix. Successful initiatives will develop these plantations as dedicated fibre sources for specific end users.

Such projects will provide a dual advantage: the restoration of hundreds of thousands of hectares of degraded land into fully functioning and biodiverse ecosystems; and the provision of an alternative to wood, which will reduce the pressure on the world's remaining forests.

Endnotes

1. This is clumping, or sympodial, bamboo.
2. In Ghana, for example, the Forestry Commission has included bamboo in its definition of forests, allowing it to be planted as a plantation species within a forestry concession. In contrast, Indonesia currently excludes bamboo as a forest species, preventing it from being planted in forestry concessions.
3. More information on the Rainforest Alliance stewardship standard for alternative natural fibers such as bamboo can be found at www.rainforest-alliance.org/agriculture/standards/alternative-natural-fibers.
4. EcoPlanet Bamboo is a privately held U.S.-based owner and developer of commercial bamboo plantations. The company is headquartered in Chicago, Illinois, and currently has operations in Nicaragua and South Africa; it is expanding into Ghana. For more information please visit www.ecoplanetbamboo.com.
5. Further details on the project's biodiversity benefits can be found in the CCBA project design document, including full species lists. See www.climate-standards.org/2012/07/14/ecoplanet-bamboo-central-america.
6. Tissue-culture plantlets are produced in laboratories. Copies of a plant are produced in a sterile culture medium. These use parent material from natural plants; they are not genetically modified.
7. This was provided through the World Bank's Multilateral Investment Guarantee Agency (MIGA), which provided a US$27-million policy. MIGA is in the process of expanding this policy to include the South African project.