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Genetically Modified Eucalyptus

Sustainable innovation in forest plantations

Global Demand

Global demand for forest products will triple and the WWF Living Forests Report estimates that to meet this, an extra 250 M ha of plantations will be needed by 2050. A global bioeconomy, based on future multiple uses of forest products will set new targets for the forest sector that could allow substitution of fossil fuel based products. As a renewable resource of sufficient quality and scale, and by sparing the ecosystem functions of natural forests, plantations will be a central component of future low-carbon growth and climate resilience. With limited scope for sustainable throughput of resources, ensuring wellbeing within planetary boundaries will require enhanced resource use efficiency, whilst meeting demand. In practical terms this will require step changes in productivity and process efficiency and an expansion of the quality, scope and scale of products and services

The Brazilian Plantation Sector

The Brazilian plantation sector has developed a credible baseline for future productivity intensification that could provide the best practice, management skills and technology to sustainably intensify plantation productivity, limit plantation spread AND simultaneously provide positive impact on ecosystem function and biodiversity conservation and social wellbeing:

- For each hectare of forest planted, an average of 0.96 hectares of natural forest is restored – establishing ecological corridors and mosaics on lands that were previously degraded. This represents a net positive gain of almost 3 million hectares of secondary forest and a significant contribution to ecosystem functions such as biodiversity preservation and carbon storage, absorbing roughly 64 million metric tons of CO₂ from the atmosphere every year.
- Brazilian plantations-based companies work with local communities to collectively agree on best practice and integrate roughly 20 thousand families in the forestry industry chain through outgrower programs in some of the poorest and most remote areas of the country. In 2013, Brazilian plantations-based companies invested \$64 million in social programs adding multiple values to the quality of life of local communities.
- Today, 100% of market pulp is produced from only 0.7% of all arable land, creating more than 4,4 million direct and indirect jobs and significantly reducing the pressure to bring natural forest areas into production.
- Suzano sources up to 30% of its fibre from outgrowers, mostly smallholders, and has helped groups become certified, covering 22,400 hectares of plantations and 13,000 of natural forest to date. This provides outgrowers a price premium, making income per hectare four fold higher than ranching – the main rural activity in most of our regions.

This plantation management framework, developed through cooperation between the plantation sector, Government, NGOs and certification bodies, enables better forestry practices, better breeding, rational landscape-scale forest zoning, better technologies, better governance and better policies WITHOUT transferring costs to consumers.

Development of yield enhanced, genetically modified eucalyptus

Since the 1970's Suzano has invested heavily in research to improve fibre quality and fibre yield based on conventional breeding using a diverse genetic base of 15,000 clones. The result has been an

increase in productivity from 21 to 41m³ ha⁻¹ yr⁻¹. This has meant that the amount of land required to feed a 1M-ton yr⁻¹ pulp mill has gone down from 171,500 to 73,500 hectares. If 1970's productivity levels were in practice today, the plantation base of Brazil would be 9.9, rather than 5.1 M hectares. Innovations in better breeding reduce plantation expansion and provide the means for forest owners such as smallholders to grow a profitable crop.

However, increases in productivity have been incremental, and are reaching a plateau. At the same time, the number of pests and diseases are multiplying due to climate change. If yield increases are to be achieved, and if yield is to be protected against future environmental shocks and stresses, new approaches for tree improvement are required.

In anticipation of this, FuturaGene, the biotechnology subsidiary of Suzano Pulp and Paper, has since 2001 been developing genetically modified eucalyptus with approximately 20% higher yield when compared to conventional eucalyptus. Undergoing field trials since 2006, this technology will enable the production of more wood using fewer resources. Field trials have been carried out under the auspices of the Brazilian Technical Commission on BioSafety (CTNBio) in accordance with National Law based on the provisions of the Cartagena Protocol on Biosafety and the principle of the Precautionary Approach.

The results of performance and biosafety studies have been submitted as a dossier in January 2014 to CTNBio, requesting commercial approval of the variety.

Deployment

If approval is obtained from CTNBio, Suzano Pulp and Paper will deploy the yield enhanced eucalyptus on a graded basis, in line with the company's forest management practices employed in the deployment of any new clone. Therefore, only a part of the plantation would be occupied by genetically modified eucalyptus, and the first crop from such planting would appear on the market approximately six or seven years later.

Context and positive impact of deployment

Deployment of yield-enhanced varieties of eucalyptus would provide a step change in the efficiency of plantation productivity on top of the existing performance baseline. Better yielding varieties would mean increased economic performance for Suzano AND its outgrowers who would have access to the technology on the same conditions they have for any conventionally improved clone. From an environmental perspective, when deployed within the context of the Brazilian plantation management framework higher yield could lead to further land-sparing for other purposes such as biodiversity conservation or agriculture. Carbon emissions would also be lowered through a reduced transportation distance from plantation to mill,

About FuturaGene (www.futuragene.com)

FuturaGene was acquired by Suzano Pulp and Paper in 2010 to enhance plantation productivity and to leverage Suzano's forestry assets. Present in Brazil, Israel, USA and China, FuturaGene develops sustainable, ecologically sound technology to meet the ever increasing demands for fiber, fuel and energy crops through two main technology platforms: yield and processability enhancement and yield protection.