An Overview of the Development of Genetically Engineered Trees in South America

Summary of issue

In the past ten years there has been an exponential increase in demand for wood and wood-fibre, which has meant the expansion (from north to south) of industrial tree plantations, and the growth of companies that supply it. In the rush to meet this massive demand — which comes from a range of industries, from the paper industry through to the rapidly growing industrial-scale bioenergy sector — companies are investing in risky new technologies in order to find ways to increase productivity. This includes the development of genetically engineered trees (known as GE trees, or transgenic trees): "*trees [are being] engineered to contain foreign DNA to give them unnatural characteristics, such as the ability to kill insects, tolerate toxic herbicides, grow abnormally fast, or have altered wood composition*." [1]

In 2003, following the 9th Conference of the Parties of the UN Framework Convention on Climate Change (UNFCCC), northern companies and governments were permitted to use transgenic trees in the establishment of carbon offset forestry plantation under the '*Clean Development Mechanism*'.[2] Moreover, the Food and Agriculture Organization (FAO) promoted research into species considered suitable for such plantations — eucalyptus in particular — and has acted as one of the main vehicles for convincing governments of the convenience of promoting such plantations in their countries. [3]

Rapid expansion of commercial tree plantations — especially in tropical regions where there are shorter rotation periods, a longer growth season, and cheap land and labour — makes places like South America, a 'perfect' target for companies in the forestry sector. At the same time the political, social and economic changes driven by neoliberalism in Latinamerica, have resulted in new and widespread expropiation and privatisation of land and natural resources, paving the way for a new era of neocolonialism (Harvey, 2004).[4] Companies like Monsanto have taken advantage of the situation and certainly found a 'perfect business scenario' in countries like Argentina, where 70% of forests have been lost, mainly to transgenic soy plantations. This has had devastating effects on biodiversity and the environment, and also on indigenous peoples, such as the Mapuches in the north of the country.[5]

Corporations have begun the process of creating a vast range of commercial products from plant matter as a replacement to fossil fuels. To this end the proponents promote the idea that trees are an ideal feedstock for this purpose, with the aid of 'modern' technologies, such as the genetic engineering of trees. But in 2008 a strong campaign against GE trees[6] resulted in the Convention on Biological Diversity (CBD) recognising that '*the potential risks involved in the release of*

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[1] Global Justice Ecology Project Briefing Paper, March 22, 2012. Analysis of the State of Genetically Engineered Trees and Advanced Bioenergy.
http://globaljustice[illegible].pdf
[2] Situación mundial de los árboles genéticamente modificados, Eco-sitio, 1 December 2009, http://www.eco-sitio.com.ar/node/80
[3] Los Árboles Transgénicos, Organiccosumers.org, 2 January 2008, http://www.organicconsumers.org/ACO/articulos/article_10007.cfm
[4] El Modelo Sojero de Desarrollo en la Argentina: Consecuencias Sociales y Ambientales en la Era de Los Agronegocios. Fernando Barri & Juan Wahren, 2009. http://www.globalizate.org/Barri%20&%20Wahren%20la%20soja%20en%20Argentina.pdf
[5] Neuquen: Mapuche defienden la Ley de Bosques, Avkin Pivke Mapu, 3 August 2012, http://www.avkinpivkemapu.com.ar/index.php?option=com_content&task=view&id=3812&Itemid=15
[6] STOP GE TREES campaign, www.stopgetreescampaign.org

genetically engineered trees outweigh the potential benefits, especially since many of those risks are impossible to foresee and could have devastating consequences'.[7]

Nevertheless, biotechnology multinationals are eagerly awaiting the opportunity to engage in the large-scale commercial release of GE trees, even though the increasing demand for wood fibre is being matched by a growing civil resistance to genetically engineered trees, in Latin America,[8] as well as in the United States and around the world.

What is at stake?

The detrimental impacts of monoculture tree plantations on the environment and on indigenous peoples and local communities have been well documented, especially throughout South America, where conflicts over land have been increasing. The introduction of GE trees can only exacerbate those problems, with its direct and indirect impacts on ecosystems and on human kind.

Biodiversity

A 2008 paper on the potential impacts of GE trees[9] states that "*genetic engineering processes can result in hundreds of genome-wide mutations, especially where tissue culture techniques are involved; furthermore, if genes for insect resistance escape into wild populations of trees, the impacts would be broad, diverse and impossible to predict*". Drifting pollen and/or seeds can reach amazing distances and since trees have longer life-cycles than agricultural crops, the long-term impacts on the natural world cannot yet be determined, unless a study that monitors the *whole* tree life cycle is carried out, including impacts on offspring and interaction with biotic and abiotic factors. So far, this remains undone.

Tropical rainforests are an important prop to continental water cycles; trees can regulate the run-off and help guarantee water-supplies and prevent natural disasters.[10] Yet the current crisis of deforestation has reduced rainforests by over 60% in the past six decades.[11] It is estimated that neo-tropical forests in Central and South America sequester at least one ton of carbon per hectare per year thanks to the increased biomass covering soils; conversely, the destruction of one hectare of forest releases 200 tons of carbon.[12]

The advancement of the commercial release of GE trees puts tropical forests in even greater danger, not only due to the conversion of native forests and other highly productive areas into GE tree monocultures - with the associated increased release of CO_2 - but also due to the possibility of genetic contamination of native trees and other species, and the invasion of native forests with non-native GMO trees. The spread of transgenes into the wild and the effect this will have on

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[7] Potential Ecological and Social Impacts of Genetically Engineered Trees - Commentary on UNEP/CBD/COP/9/INF/27, Paper on Potential Impacts of GE Trees Prepared for CBD COP-9, Bonn, Germany 19-30 May 2008. GJEP, GFC, Econexus, Ecoropa, CBAN, Stop GE Trees, https://www.cbd.int/doc/external/cop-09/gjep-analysis-en.pdf

[8] '*Chile Sin Transgenicos'* is the largest anti-transgenic network in Latin America; RAPAL-Uruguay: Grupo de Reflexión Rural (GRR) in Argentina.

[9] Potential Ecological and Social Impacts of Genetically Engineered Trees Commentary on UNEP/CBD/COP/9/INF/27. Paper on Potential Impacts of GE Trees. *Prepared for CBD COP-9, Bonn, Germany 19-30 May 2008,* submitted by the STOP GE Tree Campaign and other NGOs. https://www.cbd.int/doc/external/cop-09/gjep-analysis-en.pdf

[10] The world's lungs. A Special report on Forests. The Economist. 25 September 2010. http://www.economist.com/node/21521705; Forests in a Changing Climate, Friends of the Earth International, 2008 http://www.criticalcollective.org/?publication=forests-in-a-changing-climate

[11] Seeing the Wood, A Special Report on Forests - The Economist, 25 September 2010. http://www.economist.com/node/17062713

[12] Situación mundial de los árboles genéticamente modificados, Eco-sitio, 1 December 2009, http://www.eco-sitio.com.ar/node/80

biodiversity may be especially severe in less developed countries,[13] countries that have also suffered more from climate change phenomena. Furthermore, trees engineered for resistance to insects or herbicides--or that have reduced lignin levels--have dangerous impacts on wildlife and communities. For instance, migratory bird species rely heavily on the extremely productive and complex rainforest ecosystems for food, rest and recovery.[14] The caterpillars targeted by BT insect-resistant trees are a key food for nesting songbirds. In addition, rapidly growing GE trees dehydrate soils rapidly and can even impact water tables and exacerbate drought conditions.

Potential Deployment of GE Tree Technology will Promote Further Impoverishment of Rural Communities

The Brazilian forestry sector is responsible for around 5% of GDP, and Brazil is recognised worldwide as one of the leaders in the development and implementation of innovations in the area of genetics and forestry, most notably with eucalyptus.[15]

Companies like US-based GE tree research and development company ArborGen — which has a request pending with the US Deparment of Agriculture (USDA) to sell hundreds of millions of cold-tolerant GE eucalyptus seedlings commercially every year[16] — has already entered the South American market and is partnering with different institutions, universities and companies not only in Brazil but throughout South America. Brazil already has 4.7 million ha of non-GMO eucalyptus trees planted in a race to expand agrofuel production and exploit its natural resources to the fullest. Industry hopes that transgenic eucalyptus will be deregulated and commercially planted in Brazil within the next few years.[17]

FuturaGen (owned by Rio+20 sponsor, Suzano) is currently on the verge of releasing their fourth regulatory field trial over the past eight months, assessing 'enhanced' eucalyptus. After completion, FuturaGen plans to submit a dossier to the Brazilian National Technical Commission on Biosafety (CTNBio) requesting regulatory approval to deploy its yield-enhanced eucalyptus.[18] In June 2010 the Studies and Projects Finance Organization (*FINEP*) — a public company managed by the Ministry of Science and Technology — granted FuturaGen, US$1.2 million for advanced plantation forestry for bioenergy research. As of 2009, Suzano, owner of 310,000 ha of eucalyptus plantations in Brazil, received permission to buildfive plants designed to process wood into pellets by 2019, for sale as fuel to European thermoelectric biomass facilities.

Evidently, what is practiced today in Brazil as 'new developmentism' has inherited a great deal from the national development strategies that were devised from the 1950s onwards by the Economic Commission for Latin America (ECLA), and several large-scale projects from the times of the military dictatorship have been revived.[19] But the perception of the Brazilian development model, which is seen as a great success by many in other countries, is rather different amongst

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[13] Why is release of transgenic crops into the environment a risk?, Sierra Club, http://www.sierraclub.org/biotech/references.asp

[14] A bird's eye view of deforestation, World Migratory Bird Day, May 2011, http://www.worldmigratorybirdday.org/2011/index.php?option=com_content&view=article&id=46&Itemid=28

[15] Genomica do eucalipto no Congreso de Florestas Energéticas, EMBRAPA, 5 June 2009, http://www.embrapa.br/imprensa/noticias/2009/junho/1a-semana/genomica-do-eucalipto-no-congresso-de-florestas-energeticas/?searchterm=eucalyptus

[16] Global Justice Ecology Project Briefing Paper, March 22, 2012. Analysis of the State of Genetically Engineered Trees and Advanced Bioenergy. http://globaljusticeecology.org/files/GE%20trees%20report%20with%20cover%203:12-small.pdf

[17] Toward Commercialization Of Genetically Engineered Forests: Economic And Social Considerations. Sedjo, 2006. http://www.rff.org/rff/documents/rff-rpt-commercializationgeforests.pdf

[18] FuturaGen, press release, Sao Paulo, 2 May 2012, http://www.futuragene.com/Futuragene-Brazil-field-trials.pdf

[19] Inside a Champion: An Analysis of the Brazilian Development Model. Introduction. Heinrich Boll Foundation, 7 June 2012. Brazil. http://www.boell.de/publications/publications-brazil-inside-a-champion-economy-ecology-14760.html

Brazilian civil society. Critics say that this model incurs considerable social and ecological damage as well as significant costs. In this light, it is not so surprising that the Brazilian government might give the green light, in order to be the first country to officially deploy GE trees, at the expense of its natural resources and its peoples, generating significant profits for a few.

Other countries in Latin America may follow suit or even get there first. Back in 2004, Monsanto's former global forestry chief stated that '*Chileans could be the first to enter the market with a transgenic tree as they have a targeted goal, relationships with the government and the necessary infrastructure to reach this goal*'.[20] Since 1974 a decree on forest resources encouraged the development of large-scale tree plantations of exotic species, and subsidised 75% of the associated costs. As a result, there are over 2 million ha of these plantations on ancestral indigenous territories, especially in the south, which has led to displacement and impoverishment of Mapuche communities.[21] For instance, in the Lumaco District of Chile, the standard for planting tree monocultures on the agricultural lands of indigenous Mapuche communities, through the use of financial coercion that forced small farmers to grow trees instead of food, has led to 60% of Mapuche families in the region living in poverty, with 33% in extreme poverty.[22]

Between 2002 and 2005 projects investigating the use of eucalyptus with insecticidal properties and resistance to fungus were being developed by the Universidad de la Frontera with suppport from Innova Chile. In 2004-2007, cold tolerant eucalyptus were developed by the Universidad de Concepción and the Universidad Andrés Bello, for the company Arauco. In addition, Chile became the first Latin American country to promote UPOV 91,[23] which deals with restricting farmers' right to save and re-use 'transgenic' seeds. Countries such as Brazil and Argentina have not so far succeeded in pushing through with this highly controversial policy,[24] so it could well be that the first authorisation for the deployment of GE trees comes from Chile.

In Argentina, a forest emergency was declared in 2006 due to a severe loss of native forests, and although this effort led to a reduction in the rate of deforestation it has not stopped the expansion of soy monocultures, and it made no reference to the potential threats posed by GE tree plantations[25]. Conversely, in June 2012, Argentinian president Kirchner celebrated Monsanto's plans to invest more than USD 358,000,000 in Argentina. She stated: "*Monsanto's investment is highly important as it will help materialize our plans both for food by 2020 and industry as well […] and I said to myself, today, reading in your headline that you were impressed by the significant support that our government has given to science and technology. Please be sure that we will keep on in the same line*." [26]

Despite the lack of information about the current status of GE tree research in Argentina, the only report by the FAO (2004) regarding this issue acknowledged Argentina as carrying out lab experimentation as early as 1999[27]. Nowadays, the National Institute for Agricultural Technology (INTA) and the Center for Forestry Research and Experiences (CIEF) are conducting a series of

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[20] Cultivos transgénicos en Chile, Observatorio de Economía Latinoamericana, http://www.eumed.net/cursecon/ecolat/cl/srn-transg.htm

[21] Lovera, S. 2012. In press.

[22] Lucio Cuenca B., National Coordinator for the Observatorio Latinoamericano de Conflictos Ambientales (OLCA), speaking at a meeting on GE Trees in Vitoria, Brazil in November 2005.

[23] International Convention on the Protection of New Plant Varieties http://www.upov.int/en/publications/conventions/1991/act1991.htm

[24] Wikileaks y transgénicos, EE.UU. hizo lobby por la propriedad intelectual en Chile, 6 July 2011, http://verdadahora.cl/wikileaks_y_transgenicos_ee_uu_hizo_lobby_por_la_propiedad_intelectual_en_chile.html

[25] Personal communication, Carlos A. Vicente, GRAIN-Argentina.

[26] La presidenta feliz por inversión en transgénicos de Monsanto, 19 June 2012, http://www.noalamina.org/mineria-informacion-general/general/la-presidenta-feliz-por-inversion-en-transgenicos-de-monsanto

[27] Preliminary review of biotechnology in forestry, including genetic modification. UN FAO, 2004 http://www.fao.org/docrep/008/ae574e/ae574e00.htm

activities related to the genetics, improvement and propagation of eucalyptus tree species for enhanced growth.[28] The above-mentioned alliance could mean that Argentina — which didn't ratify the Cartagena Protocol on Biosafety — could also be interested in developing GE trees. This would create serious additional burdens impacting Argentina's ecosystems and communities, especially the Mapuche People, who have confronted a long and tough struggle against monoculture tree plantation companies.

Paraguay, where communities have also suffered from the impacts of soy expansion, is preparing for the release of five varieties of transgenic corn; the current government is explicitly in favour of genetic technologies. Likewise, Uruguay has lost a significant amount of forest cover to monocultures; and Forestal Oriental holds 35,000 ha of eucalyptus tree plantations, and has already conducted field trials for two years, concerning herbicide resistance and reduced wood lignin traits.[29] In Colombia, in 2009, the forest industry analysed the possibility of its paper and biofuel companies using GE trees to produce ethanol,[30] with help from experts from the Saõ Paulo University; and people from the Agricultural Sciences department at the Agronomic Center of the National University in Medellin started trials with eucalyptus and poplar.[31]

In countries like Perú, on the other hand, there is a moratorium against any Living Modified Organism entering the country for cultivation and harvesting, or for any other purposes related to transgenic products. Yet this moratorium could be threatened by the commercial release of GE trees in Brazil and/or other neighbouring countries as it raises transboundary contaminaton concerns.

Another important aspect of this emerging forest products sector is the extent to which transgenic wood (as opposed to germplasm) is internationally tradable. According to industry think-tank Resources for the Future, under WTO rules, non-living transgenic wood, whether raw logs or wood products, cannot be restricted in international trade simply because it is transgenic.[32]

What should happen at COP 11 and beyond?

The years 2012 and 2013 are going to be significant ones for the campaign to stop genetically engineered trees. This means that the Meeting of the Parties of the Cartegeña Protocol, as well as the Convention on Biological Diversity's 11th Conference of the Parties, need to recognise the threat that GE trees pose, especially given the current scenario of escalating demand for wood for bioenergy.

Parties must apply the precautionary principle as part of their decision regarding risk assessments relating to the movement of GE trees across state boundaries. Furthermore, the COP must enact a moratorium on the use of GE trees in bioenergy production or forest offset schemes. There are still too many unknowns and too many indications that the escape of genes from GE trees released into the environment will then be both inevitable and potentially disastrous, both for forest ecosystems and for forest-dependent communities.

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[28] Argentina camino a la fatalidad copiando modelo forestal chileno, World Rainforest Movement, http://www.wrm.org.uy/paises/Argentina/modelo.html

[29] Informe de la situación de los transgénicos en Uruguay y bioseguridad, Por María Isabel Cárcamo, RAP-AL Uruguay, http://webs.chasque.net/~rapaluy1/transgenicos/Uruguay/Informe_transgenicos_Uruguay.html

[30] En Colombia analizan experimentar con árboles transgénicos, espanol.upi.com, 9 November 2009, http://espanol.upi.com/Curiosidades/2009/11/09/En-Colombia-analizan-experimentar-con-%C3%A1rboles-transg%C3%A9nicos/UPI-57611257761940/

[31] Argentina aprueba maíz genéticamente modificado, 2 August 2012, http://www.agrobio.org/news/

[32] Toward Commercialization Of Genetically Engineered Forests: Economic And Social Considerations. Sedjo, 2006. http://www.rff.org/rff/documents/rff-rpt-commercializationgeforests.pdf

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