# Tree factories: An overview of the impacts and interests behind GE trees

Genetic engineering allows scientists to modify trees by inserting genetic material from another tree of the same species, from another tree species or from another species altogether. The attempts by research and plantation companies in the US, Brazil and other countries to commercialize engineered trees are posing an enormous risk to the world's forests.

Until now, the debate over genetically engineered (GE) organisms – also known as transgenic organisms – has mainly focused on agricultural crops, and only to a much lesser extent on GE trees. Our focus in this bulletin is not on genetic engineering of fruit trees like papaya or apple, but on eucalyptus, pine, acacia and poplar trees used in large-scale industrial monoculture, especially in the Global South. However, the fact that these trees will not be eaten – although honey produced from GE eucalyptus trees could become contaminated - does not mean that transgenic trees are any less dangerous. On the contrary, as trees live longer than agricultural crops, there could be unforeseen changes in their metabolism many years after they have been planted. For example, work is already underway on GE trees to stop them from flowering, for the supposed purpose of preventing the possible contamination of natural trees with transgenic pollen. The problem is that no one can guarantee that 20 or 30 years after they have been planted, not one of the thousands or millions of transgenic trees will flower and contaminate normal trees of the same species. The impact this could have on the species in question, on the forest as a whole and on the communities that are dependent on these forests could be devastating.

Scientists tinkering with genes in order to 'improve' trees are, in fact, changing certain genetic attributes of the trees to better serve the interests of those who are financing this research -particularly large tree plantation companies – by increasing the profitability of the businesses involved. A GE herbicide-resistant tree, for example, is not 'improving' anything - rather quite the opposite. This modified tree permits extensive fumigation with herbicides, and as a result, this will damage the soil, destroy local flora, poison fauna, pollute water and severely impact local populations' health and livelihoods.

**Who is promoting GE Trees and why?**

Much of the research that scientists are conducting into GE trees is primarily of interest to the pulp and paper industry. GE trees would in theory allow pulp mills to grow more fibre more quickly. Researchers are working on GE disease resistant trees, as large-scale monoculture plantations are particularly susceptible to diseases. Trees engineered to be sterile would grow faster since the trees would focus their energy on growing rather than producing flowers. The pulp and paper industry is also interested in GE trees with more uniform fibre, fewer branches and straighter trunks. The industry's goal is to replace its current tree plantations with transgenic trees that grow faster, contain more cellulose, are resistant to herbicides, insects and fungi, are resistant to droughts and low temperatures and do not flower.

Fossil fuel and energy-related companies are also becoming increasingly interested in engineering

trees. Faster growing GE trees with reduced lignin would make trees less fibrous, allowing an easier process for turning the wood cellulose into a liquid fuel (ethanol). This could result in the establishment of enormous plantations of GE trees for producing pulp, which would in turn be converted into ethanol. Moreover, burning of wood pellets is being promoted across much of the EU as ‘renewable energy’. This promotion increases the demand for wood and promotes more tree plantation projects being set up in the global South. Meanwhile, researchers are looking into ways of engineering trees that absorb and store more carbon, as a supposed solution to climate change.

**How did this happen?**

The forestry industry has historically tried to ‘manage’ forests to meet their commercial needs. As a result, plantations were established - of a single species of tree planted in straight, evenly spaced rows, so as to obtain the greatest possible amount of wood per hectare. This led to the progressive destruction of forests and grasslands and their replacement with industrial tree monocultures that produce nothing but wood.

This was not enough, however, and companies have adopted different measures to ‘improve’ these monocultures. The United Nations Food and Agricultural Organisation (FAO) played a key role in this regard, beginning with defining monoculture plantations as ‘forests’ and backing the establishment of these ‘forests’ in the South. It also promoted research on the tree species considered best suited for planting – particularly eucalyptus and pine – and was also one of the main vehicles used to convince governments of the supposed benefits of promoting these kinds of plantations in their countries.

The next step involved the gradual adoption of the full Green Revolution package, also backed by FAO: growing mechanisation of forestry work, and the use of chemical fertilisers, agrotoxic substances for pest and disease control, and herbicides to prevent other plants from competing with the trees planted. In the meantime, genetic selection attempted to ‘improve’ the performance of plantations in terms of wood yields, which was quickly followed by hybridisation and the cloning of the ‘best’ trees. From this reductionist perspective, the next obvious step was to genetically modify the trees.

**What are the main impacts and risks?**

Research of GE trees is not limited to laboratories and ‘controlled’ testing, but has also extended to the field and with a wide range of species. GE trees are designed to be planted in large, monoculture, industrial tree plantations, which already have serious impacts on people and forests. GE trees will increase these impacts. Here is a short list of some of the many serious impacts:

- Genetic contamination of habitats: GE trees’ pollen and seeds can be carried enormous distances by the wind, water or insect pollinators. This means that these can easily contaminate trees located a long distance away. For example, a GE insect-resistant pine tree planted in Chile could eventually contaminate trees of this species in their native habitat in the US, potentially killing off insects and causing serious impacts on the food chains to which they are linked. Propagation can also go via roots, shoots and grafts. This is one of the biggest risks associated with field trials and commercial plantations of GM trees. Regulation on a national level would then not be sufficient due to the large-scale dispersion.

- Increased pressure on native forests: although the argument “growing more wood on less land”, used by GE trees proponents, appears to be convincing, the increasing demand for wood, largely

coming from the North, increases as well the pressure on lands. In the past two decades, the plantation industry has already improved productivity of trees without using GE technology. Nevertheless, the area of industrial tree plantations was not reduced; it increased fourfold in the global South. As trees can be engineered to grow faster, resist chemicals and insects, and be freeze-tolerant, it is expected that they increase corporate profits as well as expand the number of plantations. The potential effects of commercial release of GE trees include destruction of biodiversity and wildlife, loss of fresh water, desertification of soils and severe human health impacts, all of which directly or indirectly provoke the degradation and collapse of native forests and grasslands.

- More water, more chemicals, more destruction: Trees genetically modified for faster growth are likely to consume even more water than the trees currently used in industrial tree plantations. This will lead to more dried up rivers and streams, more lowering of water tables and more dried up springs and wells. Nutrients will be removed from the soil more quickly, requiring more chemical fertilizers. GE trees will grow faster than native trees and could be highly invasive to surrounding forests, crowding out vegetation and destroying habitat for the animals and fungi that have evolved to live in native forests.

- Increase in violations of local communities' rights: Rural, traditional and indigenous communities in and around countries advancing GE tree plantations will bear the greatest burden of the negative impacts. GE trees increase the already high corporate interests over lands and 'resources'. By occupying immense quantities of lands and polluting the surrounding soils and water streams, GE trees exacerbate directly or indirectly the displacement of more communities from their territories, destroying local livelihoods, food sovereignty and control over their own territories.

- Human health risks: potential impacts include exposure to hazardous chemicals that are applied to plantations of GE trees and harmful effects of inhaling pollen from trees that produce a Bt toxin (a toxin that produces proteins that are deadly to insects). Pines for example, are known for heavy pollination, spreading pollen over hundreds of kilometres. Establishment of plantations of pines that produce Bt pollen could potentially lead to widespread outbreaks of sickness. The impacts on wildlife and humans from consuming Bt plants have not been thoroughly researched. However, animal studies found that Bt remains active in mammals that have eaten it and may in fact bind to the intestines, leading to "significant structural disturbances and intestinal growths."

- GE trees cannot help reverse climate change: the idea that planting trees can help reverse climate change is based on the false assumption that the carbon released by burning coal or oil can be considered equivalent to the carbon 'absorbed' in a tree. Fossilized carbon stored under the ground is stable and unless dug out and burned, it will not enter the atmosphere. Moreover, GE trees will only increase the number of plantations and clearing forests for plantations is one of the main drivers of deforestation. Plantations are not forests!

- GE Tree research follows the logic of constant 'growth': Whether for the purpose of producing pulp for producing paper, liquid ethanol for fuel, biomass for energy or higher carbon absorption, GE trees aggravate the current violence of the economic system.

It is crucial to oppose the expansion of tree monocultures and to join the fight against GE trees. For more information on the impacts of monoculture tree plantations, see the WRM website; and on GE trees in particular, see "Unravelling the lies: Why GM trees don't make sense", written by Chris Lang and produced by WRM and FoEI; and visit the STOP GE trees campaign website.