wrm briefing

Transgenic Trees

world rainforest movement

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Until now the debate over genetically modified organisms – also known as transgenic organisms – has mainly focused on agricultural crops, and only to a much lesser extent on genetically modified trees. This is understandable, given that transgenic crops such as corn and soybeans are already being commercially grown and will be directly or indirectly eaten by human beings, posing a potential threat to their health.

However, the fact that they will not be eaten does not mean that transgenic trees are any less dangerous. On the contrary, the dangers posed by transgenic trees are in some ways even more serious than those posed by transgenic crops, because trees live much longer than food crops, which means there could be unforeseen changes in their metabolism many years after they have been planted. For example, work is already underway on genetically engineering 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, thus rendering future generations sterile. The impact this could have on the species in question and on the forest as a whole could be devastating.

On the other hand, tree pollen can be carried enormous distances by the wind. This means that the pollen of transgenic trees can easily contaminate trees located a long distance away and result in serious impacts on forests. For example, a transgenic insect-resistant radiata or Monterey pine tree planted in Chile could eventually contaminate trees of this same species in their native habitat in the United States, potentially killing off a wide range of insects and causing serious impacts on the food chains to which they are linked.

In the case of willows and poplars, there is a well-known capacity for the crossing of different species, which means that a genetically engineered species could contaminate many other species and pass on undesired traits with regard to the functioning of ecosystems.

Despite the uncertainties and potential risks, scientists continue to tinker with genes in order to “improve” trees. Of course, what they are actually doing is changing certain genetic traits of the trees in order to better serve the interests of those who are financing this research – particularly large forestry sector companies – by increasing the profitability of the businesses involved.

From a biological point of view, however, there is no improvement whatsoever. Is a tree with less lignin better or worse than a normal tree? It is clearly worse, given the resulting loss of structural strength, which makes trees much more susceptible to damage in windstorms. Is a herbicide-resistant tree an “improvement”? No, it is not, because it permits extensive fumigation with herbicides, which affect the soil where the tree is planted, while destroying local flora and impacting on wildlife and human health. How can a tree with no flowers, no fruits and no seeds be of use to living beings, including human beings? It cannot provide food for the numerous species of insects, including honeybees, birds, and other species that depend on the trees themselves or the insects that feed on them for their own sustenance. Is a tree with insecticidal properties an improvement? It is actually a threat to many species of insects that in turn form part of larger food chains.

From a socio-environmental point of view, transgenic trees are a very dangerous step, and it is important to analyse who is promoting them and why. The forestry industry has historically had the greatest interest in adapting forests – perceived as “disorganised” and “unproductive” from a business perspective – to meet their commercial needs. As a result, forestry sector scientists and technicians have been assigned with the task of “improving” forests. The solution was to establish plantations 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 forestry companies have adopted different measures to “improve” these monocultures. The first step was research to identify the most appropriate trees for each country and each environment and to select those with the best qualities for the goal being sought: the production of wood for industry. 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 countries of the South. But the FAO’s role was not limited to this. It also promoted research on the tree species considered best suited for planting – particularly eucalyptus – 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.

Based on the results of the first plantations, research continued into selecting the most suitable species, concentrating above all on rapid growth, straight trunks, sparse and thin branches, and wood suited to industrial use.

The second 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.

The following step was traditional genetic selection 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.

It is important to note that the imposition of this increasingly artificial model of large-scale plantations of rapid-growth trees has been accompanied by increasingly vocal and widespread opposition from local communities affected by its serious social and environmental impacts.

Nevertheless, despite this opposition and despite the potential dangers of genetically engineered trees, scientists are continuing to move forward with their research. What’s more, this research is not limited to laboratories and controlled testing, but has also extended to the field. This is illustrated by the case of China, where well over a million transgenic poplars engineered to be resistant to insects through the insertion of genes from a specific bacteria (*Bacillus thuringiensis*) have been planted.

This research is not only being undertaken on poplars, but also on a wide range of other species (willows, elms, firs, walnut trees, etc.), which also include, as could only be expected, the favourite species of the pulp and paper industry: eucalyptus and pine.

This is not merely by chance, because it is precisely the pulp and paper industry that is one of the main promoters – and biggest funders – of research on transgenic trees. The industry’s goal is to replace its current “normal” tree plantations – if it is possible to classify current plantations as “normal” – with cloned transgenic trees that:

- grow faster
- contain more cellulose and less lignin
- are resistant to herbicides
- are resistant to insects and fungi
- are resistant to droughts and low temperatures
- do not flower.

At the same time, the pulp industry – like the fuel industry – is also researching the possibilities of genetic manipulation of trees and enzymes for the conversion of cellulose into a liquid fuel (ethanol) that could be used as a substitute for oil in transportation. This could result in the establishment of enormous plantations of transgenic trees – poplars, willows, eucalyptus trees and others – whose wood would be used to produce pulp, which would in turn be converted, with the help of transgenic enzymes, into ethanol.

The genetic engineering of trees for these and other purposes is being carried out in numerous industrialised countries, such as Australia, Canada, China, Finland, Germany, Japan, New Zealand, Portugal, Spain, Sweden, the United Kingdom and the United States. In Latin America, Brazil and Chile are the countries most involved in this endeavour.

In Brazil, research has been focused on eucalyptus trees, and authorisation has also been granted – with certain restrictions – for field tests with genetically modified trees of this species. In this case, the main goal is to provide more, cheaper and better raw material for the pulp export industry. As such, the most sought-after traits are rapid growth, a higher proportion of cellulose and resistance to the herbicide glyphosate

In Chile, research is aimed at solving two problems that affect the big forestry companies operating in this country. The first goal is to genetically engineer pines to make them resistant to an insect currently attacking plantations (the pine shoot moth). The second is to genetically modify eucalyptus trees to make them more resistant to cold temperatures and thus extend eucalyptus plantations – which are being actively opposed by the Mapuche indigenous peoples – further towards the country's southern region and higher into the mountains.

Nevertheless, it is important to note that all of this research, both in our own regions and beyond, affects all of us, because the trees being genetically manipulated today in New Zealand or Chile or any other country could soon be the trees being planted in Uruguay, or Colombia, or South Africa, or Indonesia.

It is important for everyone to know that plantations of transgenic trees will only exacerbate all of the impacts of current industrial tree monocultures. Essentially, trees that grow more rapidly will exhaust water supplies more rapidly; there will be greater destruction of biodiversity in the biological deserts of trees genetically modified to be resistant to insects and to not produce blossoms, fruits or seeds; the soil will be destroyed at a faster pace by the increased extraction of biomass; intensive mechanisation will eliminate even more jobs; the increased use of agrotoxic substances will affect the health of humans and ecosystems; and sources of livelihood will be taken away from more communities displaced to make room for even more "green deserts".

This is why it is crucial for all organisations and communities that are opposed to the expansion of tree monocultures to join in the fight against transgenic trees, to prevent this threat from becoming a reality.

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For those interested in more information on transgenic trees, WRM has published a book, a special bulletin and a series of articles on this subject, all of which are available on our website at:
http://www.wrm.org.uy/subjects/biotechnology.html
The site also provides links to a video and other information on this issue.