

GM TREES LOST IN CHINA'S FORESTS¹

Sam Burcher[©]

One Million GM Trees

Fifty years of relentless development has forced China's forests into retreat. Inevitable environmental consequences such as desertification and flash floods have resulted in China becoming a net importer of wood. The Great Green Wall project (2001) sponsored by the Government aims at planting a 2800-mile long shelterbelt of trees across the northwest rim skirting the Gobi desert. This is intended to combat sandstorms blowing closer to Beijing, at a cost of 96.2b yen. Over one million GM trees have been planted in "reforestation" initiatives since commercialisation was approved by The Chinese State Forestry Administration in 2002. In the northwest regions of Xinjiang province 8 000 square kilometres of farmlands are given over to GM tree mono-plantations. A further 400 000 GM poplars planted around the headlands of the Yellow and Yangtze Rivers continue to be plagued by insect pests although they are engineered to be pest resistant. GM trees introduced into the environment without any proper controls have subsequently been "lost" to monitoring.

Wang Huoron from the Chinese Academy of Sciences told the UN Food and Agriculture Organisation (FAO) in 2003 that the GM poplars "are so widely planted in China that pollen and seed dispersal cannot be prevented." He also reported to the FAO that without any licensing system and exchanges between nurseries of traditional and GM plant varieties has made it "extremely difficult to trace" the location of GM trees.

Poplars, whether GM or non-GM, are susceptible to pathogens and the more varieties of poplars introduced into forests, the greater the risk of pathogens. Leaf rust is the most significant disease of poplars worldwide. Yousry-El-Kassaby, a forest geneticist at the University of British Columbia response to China's rapid reforestation projects was cautious, he said "Instead of going through the more labourious process of traditional breeding for disease and pest resistances, these quick fix, single-gene technologies are really attractive, in the same way they are for [GM] crops."

The Chinese State Forestry Bureau effectively has no licensing system over GM trees and The Department of Agriculture is powerless to control GM trees because they are not classified as crops. According to the Nanjing Institute of Environmental Sciences there is an urgent need for communication between the two government departments as genes from GM poplars have transferred to nearby natural trees.

Transgenic poplars cross with native species

Professor Steve Strauss leads a scientific research team from Oregon University that generally supports GM technology, but acknowledges that GM poplars can readily cross with wild trees that grow near poplar plantations and that their potential environmental impact "is large because of their extensive dispersal of pollen and seeds." The team found a further seven areas that needed to improve the overall scientific risk assessment of GM trees, but considered none of the knowledge gaps too wide that they should preclude common use. However this conclusion

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presumed that reasonable research and monitoring are done as part of commercialisation, clearly not the case in China. Poplars are almost exclusively dioecious (separate male and female trees) and obliged to outcross in order to reproduce. Reproduction begins when the trees are very large, between 4-15 years of age, when long distance gene dispersal of both pollen and seeds is possible. Poplar seeds are embedded in a cotton-like matrix that enables floatation on wind and water. The seeds are small and soon lose viability; so they must find sites with both sunlight and water quickly in order to survive. Poplars do not produce seeds banks and are intolerant of shady habitats.

Once a young poplar has established in a safe site, it can persist in the environment for a remarkable period of time. The life span of a single poplar is between 50-300 years. They are also capable of vegetative reproduction and can vigorously sprout from stumps of "dead" trees once they have been cut or fallen down from natural causes. In addition, tissues from cottonwoods such as boles, branches and shorts can break off and float down rivers or streams and establish new trees. Aspens are particularly vigorous root sprouters, enabling clones to spread widely over the course of many years.

Poplars (*Populus nigra*), aspens (*Populus tremuloides*) and cottonwoods (*Populus deltoides*) have been transformed with *Agrobacterium* plasmid vector delivering synthetic copies of the genes for Bt toxins (from soil bacterium *Bacillus thuringiensis*) Cry3a and Cry1. Transgenic poplars are considered to be of "zero-low risk" by the Chinese regulatory system, rather too rashly.²

GM Trees Benefit Industry Not the Environment

GM trees are engineered to grow faster than native counterparts and produce up to 50% less lignin, which is the substance of wood. Removing lignin makes the tree less fibrous and cheaper to pulp for industry. But it also reduces the trees' fitness in the environment and leads to decreased biomass and degraded biodiversity. Genetic modifications like reduced lignin may also weaken the trees capacity to withstand high winds and flooding, negating explicit reasons for GM trees planted in China as a buffer against environmental forces.

A four-year GM tree trial by agribusiness Syngenta established that reducing lignin increased growth rates, but failed to investigate ecological impacts. So far, nearly two-thirds of research on GM trees for forests has taken place in the USA according to UN FAO statistics. Experiments have taken place on restricted test sites only, with the exception of the orchard papaya, engineered to resist the insect-borne ringspot virus, which was engineered and released by the University of Hawaii and contaminated non-GM seeds stocks, organic farms, backyard gardens and wild trees across the country.

Forestry is a global growth industry and corporations are keen to be involved in research on GM trees directly as well as sponsoring public sector research. International Paper (a partner in ArborGen, the world's largest GM tree company) and the biggest producers of papers and packaging, Westvaco, (a US company owning 1.5 million acres of industrial tree plantations in the US and Brazil) and Monsanto support research on GM trees at Oregon and Washington Universities. Not one of these projects involves recycling paper or reducing the use of paper for packaged products.

² GM Forest Trees – The Ultimate Threat, Mae-Wan-Ho and J. Cummins, ISIS Report 28/02/05

GM Trees Not the Answer

In Brazil local communities have been evicted to make way for large plantations of GM eucalyptus. Native forests known as the "cerrado" in the state of Minas Gerais were ripped out and replaced by mono-plantations. The "Genolyptus" project is thirteen companies working with Brazil's Ministry for Science and Technology to improve "pulping characteristics of Eucalyptus destined for Brazilian markets". Owners include International Paper, Suzano, and The Plantar Group presented with The Treetanic Award (like Titanic) for the worst carbon sink project at the COP9 conference in Milan 2003. The World Rainforest Movement report on the eucalyptus plantations in Brazil and Thailand set out the impacts as follows; evictions and appropriation of lands, depletion and contamination of water and soils, deforestation, destruction of biodiversity, net loss of jobs, bad working conditions, loss of livelihood and risks to health.

This year's Nobel Peace Prize winner Wangari Maathai is monitoring genetically enhanced eucalyptus in Kenya planted by The International Service for the Acquisition of Agri-biotech Applications (ISAAA), "Tree Biotechnology Project." Faster growing eucalyptus cause streams and ponds to dry up and the water table to drop, and are called "munyua maa" translating as "drinker of water." She said, where introduced species replaced indigenous forest, "farmland has lost water and certain crops like bananas, sugarcane, and local species of arrow root no longer thrive on the drier farmlands to give food security to local communities." A threat to GM eucalyptus is Blue Gum Chalcid, a tiny black insect which The Kenya Forestry Research Institute reported as worst affecting trees produced through biotechnology. ISAAA funded by Monsanto, Bayer and Syngenta amongst others denies that the eucalyptus trees in Kenya are GM.

Further question marks over the integrity of GM trees and mono-plantations are raised over the killing of a 17-year-old tree protector in Mapuche, Chile. The boy was shot dead by a security officer who had no charges brought against him. Four other indigenous activists were sentenced to ten years in jail apiece for protecting their medicinal herbs, water, land and animals that are either lost or contaminated by the fumigation of plantation trees.

Global Ban Needed on GM Trees

The WWF's report *GM Technology in the Forest Sector* warns of risk of genetic pollution and superweeds and calls for a global moratorium on commercial GM tree plantations. The WWF report points out that the commercialisation of GM trees is driven by the private sector and multi-nationals investors who take advantage of the lack of controls in developing countries. Other countries undertaking GM field trials include Australia, Canada, Chile, France, Italy, Japan, New Zealand, and South Africa. In the United States 124 field tests of genetically altered trees had been authorized, including transgenic spruce, pine, poplar, walnut, citrus, cherry, apple, pear, plum, papaya, and persimmon.

GM trees engineered with *Agrobacterium* are considered to be "transgenic elite clones" by the biotech industry, which require limited field testing for commercial growth and "can be rapidly deployed without further breeding to stabilise transgenic traits." Hectares of herbicide tolerant GM monocrops flanked by herbicide tolerant GM trees that can be sprayed side by side with company herbicide defines biotech attitudes towards sustainability and biodiversity. Dietrich Ewald, a German scientist from the Institute for Forest Genetics and Forest Tree Breeding in Waldsiederdorf, travelled to China to visit a GM poplar plantation 60 km north of Beijing, where he noted that there was nothing growing between the regimented rows of trees, only dry, barren

soil. His photos labelled "No ground vegetation" show the stark contrast between the plantations and biodiverse forests.

The Canadian Forest Service, a sector of The Natural Resources of Canada, is conducting field-testing of GM poplar, GM white spruce and GM black spruce. More than one million white spruce seedlings stemming from a few seeds were distributed across Canada during the year 2000 as "Millenium trees." The test forests are very large and experiments using "environmentally friendly controls such as Bt" go on for about five years at a time. The tests are done at The Laurentian Forestry Centre in the suburbs of Quebec City, where scientists have recently applied for joint patent applications on GM eastern white pine, GM western white pine, and GM conifers.

The Forest Forum in Finland, comprising the Union of Ecoforestry, Peoples Biosafety Association and Friends of the Earth Finland, is campaigning to ban GM trees on the principle that they contravene the Cartagena Protocol on Biosafety. They are conducting an on-line conference in which critical scientists, environmental justice movements, farmers, indigenous people, gardeners and forest owners discuss strategies for local and global resistance to GM trees.