





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## Frankenforests: GE Trees Threaten Ecosystem Collapse

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***Across the US and the world, the timber industry is driving research behind genetically engineered forests. But environmentalists worry that it will open an ecological Pandora's Box.***



In China, over a million poplar trees have been planted since 2002 to combat deforestation. But the move has not been widely applauded by everyone. The poplars, which are genetically engineered, are China's first foray into the world of transgenic forestry - or "frankenforests" - and other countries are not far behind.



As the biotech industry continues to lay the groundwork for genetically engineered crops - poorly tested, widely debated and yet plugged as a technological wonder - a potentially greater threat to biodiversity has begun to emerge. Pushed forward by biotech and the multibillion-dollar timber industry, genetically engineered trees are the latest invention.

"The industry has tried very hard to keep it quiet, or tout the technology as benign and beneficial to the environment," says Anne Petermann, co-founder of the [Global Justice Ecology Project](#), a nonprofit established to advance global justice through ecological awareness. "The technology is moving forward very quickly, outpacing regulations. There are no controls in place to properly address or assess the risks - which are major."

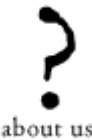


GE trees are planted in monoculture forests, which look more like plantations, and pose serious risks to the ecosystem. Trees live decades or centuries longer than plants, and their seeds can travel hundreds of miles, increasing the likelihood of gene contamination to wild species. The technology was created to optimize the manufacturing process, but environmentalists worry that it will open an ecological Pandora's Box and threaten the health of the forests we depend on for survival.

### The World Is a Test Lab



GE forestry research is already alarmingly prevalent across the globe. The United States leads the world in research projects, with 150 tree test plots - two-thirds of the world's known research areas - and they are joined by Australia, Brazil, Canada, Chile, China, Finland, France, Germany, Japan, New Zealand, Portugal, Spain, Sweden, the United Kingdom and the United States.



Despite the prevalence of the practice, GE forestry has remained somewhat obscured by GE crops, which have raised more immediate health concerns, as forestry "doesn't seem to affect the daily shopping trip - or at least, less visibly," according to Larry Lohmann, a researcher with U.K.-based [Corner House](#), a nonprofit that fights for social and environmental justice.

"But the problems transgenic trees pose are just as severe. Whether it's endangering wild species or pollen drift, the fact is we're in danger of setting off a chain of events that's irreversible. We don't know what we're messing with," he says.

From the perspective of the timber industry, driven by commercial pressure and deforestation to "build" its own resources, the case for GE trees is clear-cut. Uniform, faster-growing species produce more paper or lumber in a shorter period of time, driving down costs. Faster-growing trees also produce greater biomass, which can potentially be converted into a second-generation biofuel - an important financial incentive in the current gold rush for agrofuels. Biomass furthermore acts as a carbon sink, sucking carbon dioxide emissions from the air, which the industry claims is an environmental plus, though native forests actually absorb more. The industry's outlook is simple: The technology poses minimal risk with maximum return.

"The industry is looking for a way to make more money, damn the consequences. What's driving this is not environmental concern, but mass production - you can't say that's environmentally friendly," says Lohmann.

Concerns over the technology's long-term impact are serious. "The forests are already under tremendous pressure from climate change and human interaction," says Dr. Ricarda Steinbrecher, co-founder of the London-based nonprofit science watchdog [Eco-Nexus](#). Steinbrecher, also co-author of "Hungry Corporations: Transnational Biotech Companies

Colonize the Food Chain," has a Ph.D. in molecular genetics.

"Compared to crops that have been cultivated for thousands of years, trees are 'wild.' If a GE trait enters a forest species, the implications could be absolutely horrendous. We could see the ecological system weaken and collapse. Without the forests, we're sunk."

Steinbrecher's fears resonate deeply with environmentalists. Given genetic science's infancy, which has been plagued repeatedly by controversy, biotech - with its thrust towards profit - has continued to promote its art as a magic bullet solution. But there's always the risk of misfire. And now that trees have been loaded into the barrel, environmentalists, those involved in forestry, indigenous peoples and scientists have worked to raise the alarm.

"Forests are crucial to us," says Alexander Evans, research director at the [Forest Guild](#), which promotes responsible forestry in America, noting how they are one of the most valuable and little-understood ecosystems in the world. "When it comes to GE, the potential risks are not well understood, so why go into it? We're not into the quick-return model - there are too many hidden costs. There's simply no reason to take the risk."

The risks, in fact, are numerous. Genetically modified trees have been engineered to exhibit unnatural traits such as herbicide tolerance, insecticide production, reduced lignin content, the substance that makes trees strong but must be removed to make paper, and finally, sterility.

Many of these qualities have already proved problematic. For example, herbicide-resistant trees are meant to reduce the quantity of herbicides applied to tree plantations, yet experience shows that farmers who converted to herbicide-resistant, genetically modified crops used just as much herbicide as their counterparts, according to the [World Wildlife Fund](#).

Or take sterility, also known as terminator technology and by far the most controversial. In GE crops, this strategy was used to prevent farmers from saving and replanting seeds, thus compelling them to buy from dealers - a highly lucrative move for the multinational/agrochemical seed industry. With trees, however, the technology is meant to act as a biosafety control to prevent contamination as trees, large organisms with a long life span, have enormous potential for gene flow.

So far, engineering persistent sterility has been impossible. But its success would be worse, creating sterile trees that would produce no seeds, pollen, fruit or flowers, sources of food for thousands of species of birds, insects and animals. Instead, sterile trees would comprise forests akin to silent green desserts, devoid of life.

"From a scientific perspective, we haven't got a clue what the response (in GE trees) will be. There's real arrogance in

saying that we do," says Steinbrecher. "Genome scrambling isn't like moving Lego blocks. It's introducing a number of mutations into the plant's DNA, and the side effects are not something we can predict."

### **The US Approves GE Trees**

Back in the States, however, major transgenic tree projects are in the works. On July 16, APHIS (Animal Plant Health Inspection Service), a subsidiary of the U.S. Department of Agriculture, approved a request by forestry giant ArboGen to let a field of genetically modified eucalyptus trees flower and produce seeds - a monumental move that has alarmed environmentalists worried about GE trees interbreeding with wild ones.

"The USDA has basically been rubber-stamping things without doing a thorough environmental assessment," says Petermann of the Global Justice Ecology Project, critical of the USDA's decision to give the green light to ArboGen, a \$60 million venture between International Paper, the world's largest forest and paper company, and Westvaco, another huge U.S. multinational forest products company. "Trees live for decades, so to do a thorough study, you have to study them for decades," she says.

Not that USDA approval counts for much these days. The pro-GE department has strong ties to biotech, going so far as to sue other nations before the World Trade Organization over bans on genetically engineered crops grown in the United States. Such political cronyism these days is rampant, leaving the fox guarding the henhouse.

ArboGen has invited serious criticism on several fronts: In its permit application, the company classified certain genes as confidential business information, meaning even the USDA could not assess their impact; its field trial site in Alabama is prone to severe storms that could blow eucalyptus seeds much farther than the mere 100 meters the USDA anticipated.

And there's also the choice of trees. Eucalyptus, a fast-growing, high-yield hardwood, is notorious for colonizing native ecosystems. The species has become so successful in California, it's now listed as a plant pest by the state's Invasive Plant Council. The tree additionally depletes ground water, exacerbating drought conditions, and is extremely flammable, potentially causing massive wildfires, an ongoing issue for the American South, where ArboGen is headquartered.

By far, the largest threat ArboGen poses, however, is gene drift. Trees are perennial plants that can spread seeds and pollen for hundreds of miles, or even further. According to new research from Duke University's Center on Global Change, which has studied pollen from GE conifer trees, the pollen from transgenic pines can spread more than a thousand miles, leading to "substantial ... subsequent colonization."

Gene drift in agricultural crops has already occurred rapidly. Take, for example, StarLink Maize, a GM variety

approved only for animal feed, which entered the human food chain in the United States, Canada, Egypt, Bolivia, Nicaragua, Japan and South Korea.

With trees, contamination is more worrying because they are long-living, complex organisms that are key to the planet's ecosystem. China's Nanjing Institute of Environmental Science has already reported contamination of native poplars - what's to stop this from spreading elsewhere?

"There's no way to experiment safely in the open with this technology. Companies say it's very safe and that they have testing protocols, but it's an illusion to think, once contamination starts happening, that it's somehow going to be regulated," says Lohmann. "That depends on the assumption that you know what could go wrong."

Steinbrecher, too, finds the promise of halting GE contamination and thus interbreeding with wild trees a "scientifically meaningless argument that's unsatisfactory and unconvincing."

"You cannot design a biological system that's 100 percent fool-proof," she says. Data backs her up. According to the Food and Agriculture Organization of the United Nations (FAO), even at a 95 percent success rate, it is nearly impossible to control gene flow through pollen and seed dispersal.

"Contamination is inevitable and irreversible," says Petermann. "Regulations need to be put in place now to properly address and assess the risk from these trees because the industry is getting them out there without public debate. Once it's too late, it really is too late."

### **Industry's Spin**

To pacify these concerns, projects such as the European Union-funded Transcontainer scheme have been created. A three-year, 5.38 million Euro research project, Transcontainer is aimed at developing technology to allow the coexistence of GE and non-GE crops, as well as GE trees, through technology that reverses sterility - what critics refer to as zombie seeds. In other words, seed fertility can be recovered, possibly with a chemical application, which critics fear would create a new monopoly for the seed industry.

"This is not a viable solution. No molecular technology exists for biocontainment - and if it doesn't prevent 100 percent gene flow, it's not a workable option," says Hope Shand, research director of ETC Group, an organization that supports socially responsible technology. "Why should taxpayers, farmers and society be asked to accept the burden of defective technology and then accept an even riskier technology to fix it? You really have to look at it in this light. This technology is not safe. It shouldn't be used."

But according to Piet Schenkelaars, a Dutch biotech consultant for the Transcontainer project, research is still in its infancy. Schenkelaars agrees the technology isn't failsafe at the moment - that's exactly why research is being conducted. "In a couple of years, we can deploy the technology for more commercial purposes if it works as it should - but that's something we don't know at the moment," he says.

Asked why, in the face of great public rejection of GE crops, Europeans were being asked to support similar research, Schenkelaars responded that public opposition was questionable. "Whether people reject GE is doubtful. Surveys on public attitudes within Europe show different levels of acceptance," he says.

However, substantial public resistance to genetically modified crops does exist. In Europe, the most recent Eurobarometer, a survey conducted since 1991, indicated that most Europeans remained skeptical of genetically modified crops, expressing moral objections about potential risks.

Or closer to home, take Quebec. A survey conducted for Quebec Science found that more than 75 percent of the province's residents would rather pay extra for organic food than buy GM foods at lower prices. And in America, studies by the [International Food Information Council](#) and the [Pew Initiative on Food and Biotechnology](#) found nearly an identical lack of awareness of GM foods among consumers. But when respondents were told how pervasive GM foods are in the United States, they were outraged.

Says Schenkelaars, "I think we should develop our options as much as possible and keep our minds open. Indeed, this technology is very complex. We need to proceed with caution."

On that most critics would agree but find the very existence of Schenkelaars, a public relations consultant fronting questions for biotech, troubling.

"This is boiling down to a PR battle. There are two things research has shown are the industry's biggest concerns: contamination and public opinion," says Orin Langelie, co-founder of Global Justice Ecology Project. "The industry is going to pull out their wallets to convince the public this is good, but it's our job to broaden the debate. We don't have money for big ad campaigns, but I guarantee the other side does."

One thing that's missing in the current dialogue is discussion of natural alternatives, such as hemp. Hemp does not need pesticides or herbicides and yields three to four times more usable fiber per hectare per year than forests. But growing hemp remains illegal in the United States, where the DEA has taken a hard line on the crop as a result of the war against its psychoactive cousin, marijuana, even though hemp contains only trace amounts of THC. In terms of biofuels, hemp is capable of producing 10 tons of biomass per acre in four months - 10 times more methanol than corn, according to the [Hemp Industries Association](#).

Clearly, as this issue garners wider attention, alternatives should be sought and public debate welcomed. Says Shand, "Research continues to be done on something that has been repeatedly rejected by the public, so why not put that money into researching something more sustainable? We keep hearing the argument that technology, like sterility in trees, is safe, but safe for whom? Is it safe for companies introducing huge monoculture plantations, or is it safe for the trees? You have to look at the larger impact."

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